

5 CUMULATIVE IMPACTS

5.1 Introduction

The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of the National Environmental Policy Act of 1969, as amended (NEPA) are found in 40 CFR Parts 1500–1508. Cumulative effects are defined in 40 CFR 1508.7 as

“the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.”

Cumulative effects or impacts¹ can result from individually minor but collectively significant actions taking place over a period of time. This Supplemental Environmental Impact Statement (SEIS) considers the cumulative impacts of past, present, and future actions in the proposed project area. These actions include oil and gas production; coal mining and coal bed methane operations; gold, sand, gravel, and limestone mining; *in-situ* uranium recovery (ISR) operations; conventional uranium mining; wind farms; transportation projects, and livestock grazing.

The identification of cumulative impacts of the proposed action resulted from an analysis of an extensive body of publicly available information on ongoing and proposed federal projects, information presented in the Generic Environmental Impact Statement (GEIS) (NRC, 2009a), and review of the literature of the environmental and socio-economic conditions in South Dakota and in the nearby communities.

A number of uranium exploration and oil and gas operations are underway within 16 km [10 mi] of the proposed Dewey-Burdock ISR Project. Several ISR uranium projects within the broader region of the proposed Dewey-Burdock ISR Project are in the operation, licensing, or prelicensing stages. Oil and gas operations are underway throughout the area. There is potential for wind energy generation within and in the vicinity of the proposed project area. The U.S. Nuclear Regulatory Commission (NRC) anticipates growth in extraction of coal, coal bed methane, and limestone, as well as government support for and industry interest in developing transmission and transportation infrastructure at distances beyond 16 km [10 mi] from the Dewey-Burdock site.

The GEIS (NRC, 2009a) provides a methodology for conducting a cumulative impacts assessment following CEQ guidance (CEQ, 1997). SEIS Section 5.1.1 describes past, present, and reasonably foreseeable future actions identified and analyzed in the cumulative impacts analysis. The methodology NRC staff used in conducting the cumulative impact analysis in this SEIS is described in Section 5.1.2.

¹In this SEIS, “cumulative impacts” is deemed synonymous with “cumulative effects.”

5.1.1 Other Past, Present, and Reasonably Foreseeable Future Actions

The proposed Dewey-Burdock ISR Project is located within the Nebraska-South Dakota-Wyoming Uranium Milling Region defined in the GEIS (NRC, 2009a). This region encompasses parts of Sioux and Dawes Counties in Nebraska; Fall River, Custer, Pennington, and Lawrence Counties in South Dakota; and Niobrara, Weston, and Crook Counties in Wyoming (Figure 5.1-1). The Nebraska-South Dakota-Wyoming Uranium Milling Region holds significant reserves of uranium and has a history of conventional uranium surface mining (NRC, 2009a). Other natural resources that are currently being exploited within the milling region and in surrounding counties include oil and gas, wind, coal, coal bed methane, limestone, and gold. Federal agencies have completed several environmental impact statements (EISs) related to activities within the Nebraska-South Dakota-Wyoming Uranium Milling Region. Most of these EISs are related to resource management actions on federal lands administered by the U.S. Forest Service (USFS) or U.S. Bureau of Land Management (BLM) and are focused on improving natural resources conditions and reducing adverse impacts from various human-related activities.

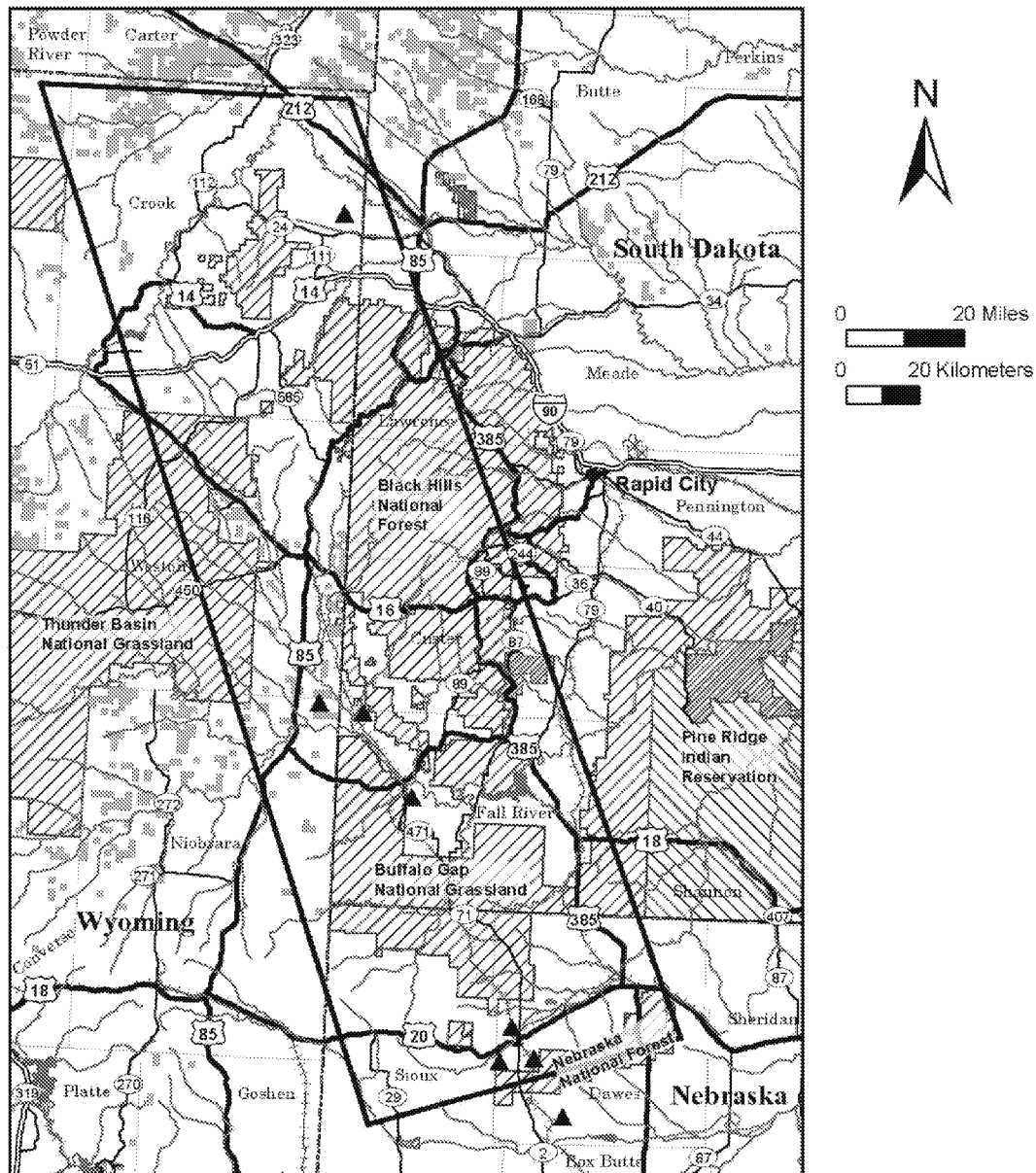
The various past, present, and reasonably foreseeable future actions in the vicinity of the proposed Dewey-Burdock ISR Project are discussed next.

5.1.1.1 Uranium Recovery Sites

Existing and potential uranium milling operations within the Nebraska-South Dakota-Wyoming Uranium Milling Region exist in the Crow Butte Uranium District located in northwestern Nebraska, in the Southern Black Hills Uranium District in southwestern South Dakota and east-central Wyoming, and in the Northern Black Hills Uranium District in northeastern Wyoming (Figure 5.1-2). Existing and potential uranium recovery sites in the Nebraska-South Dakota-Wyoming Uranium Milling Region are listed in Table 5.1-1.

Seven existing and potential ISR facilities and one uranium recovery and mill tailings facility licensed under Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II are in the region. The only operating ISR facility is at Crow Butte in Dawes County, Nebraska, approximately 105 km [65 mi] south-southeast of the proposed Dewey-Burdock ISR Project. Three satellite facilities or ISR expansions are planned for the Crow Butte site: North Trend, Three Crow, and Marsland. License applications for North Trend and Marsland were submitted to NRC in June 2007 and May 2012, respectively, and are under review. A license application for Three Crow was submitted in August 2010 and withdrawn and has not yet been resubmitted.

In addition to the proposed Dewey-Burdock ISR Project, the applicant has identified other potential uranium orebodies in the region at Dewey Terrace in Niobrara and Weston Counties, Wyoming, and at Aladdin in Crook County, Wyoming (Powertech, 2009b). Dewey Terrace is just west of the proposed Dewey-Burdock ISR Project in Weston and Niobrara Counties, Wyoming (Figure 5.1-3). The uranium orebodies at Dewey Terrace are a continuation of the mapped orebodies at the Dewey-Burdock site (Powertech, 2009b). To date, the applicant has not submitted a letter of intent to NRC for either Dewey Terrace or Aladdin. NRC therefore has no specific information that the applicant plans to go forward with these projects. It is also uncertain whether, if either project went forward, the applicant would seek to operate these projects as satellite facilities and ship uranium-loaded resins from Dewey Terrace or Aladdin to the proposed Dewey-Burdock site for processing into yellowcake. NRC staff and other local



SOUTH DAKOTA - NEBRASKA REGION

- | | | |
|--|-----------------------------------|-----------------------------|
| ▲ Ur Milling Site (NRC) | | Federal Lands |
| ● City | | ▨ Forest Service |
| ▭ South Dakota - Nebraska Milling Region | | ▨ Department of Defense |
| ══ Interstate Highway | ▨ Water bodies (Lakes, Bays, ...) | ▨ Bureau of Land Management |
| ══ US Highway | ▨ Rivers and Streams | ▨ National Park Service |
| ══ State Highway | ▨ State Boundary | ▨ Bureau of Indian Affairs |
| --- Railroad | ▨ Counties | ▨ Bureau of Reclamation |

Figure 5.1-1. Nebraska-South Dakota-Wyoming Uranium Milling Region General Map With Current (Crow Butte, Nebraska) and Potential Future Uranium Milling Site Locations

Source: Modified From NRC (2009a)

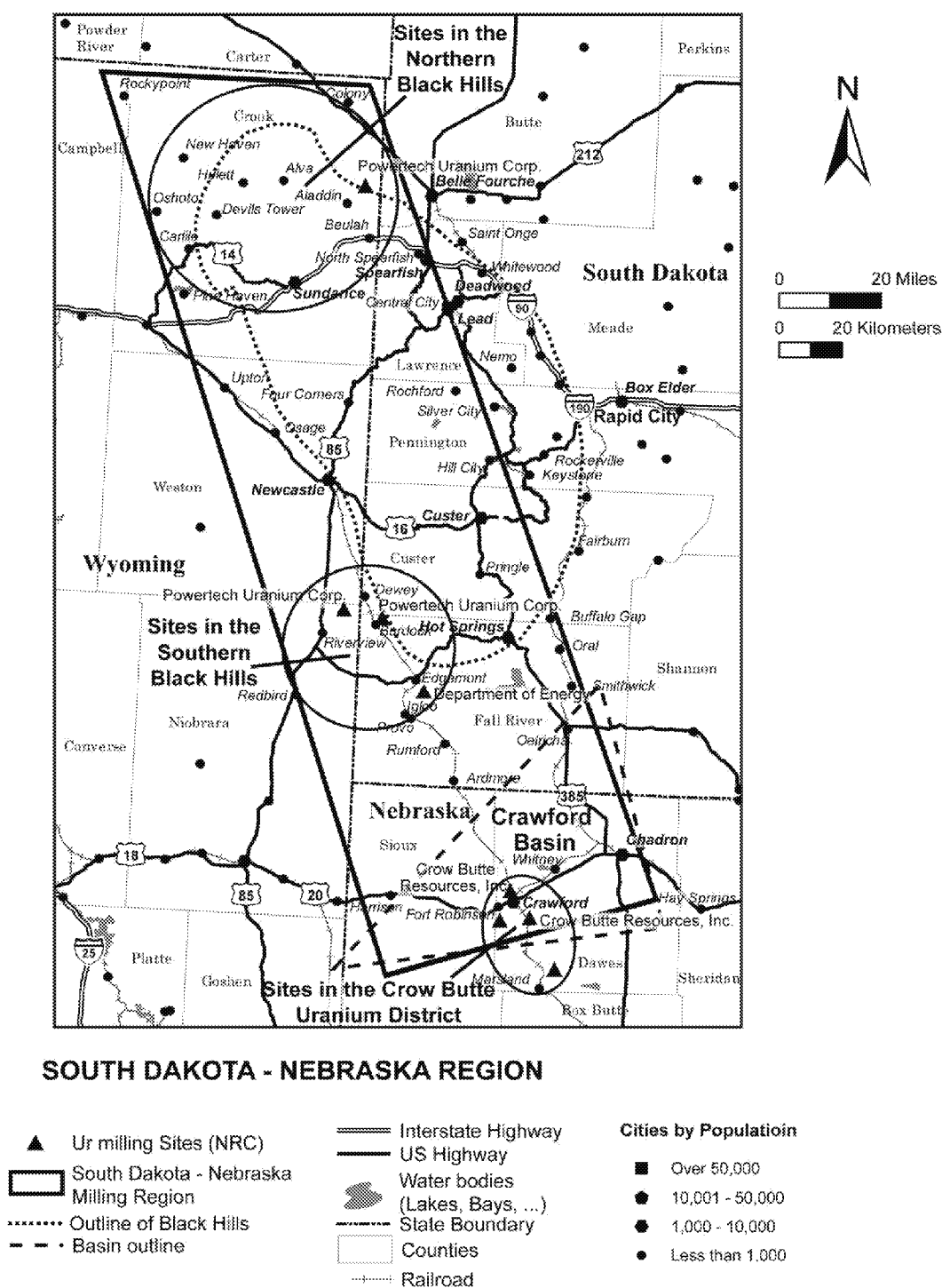


Figure 5.1-2. Map Showing the Nebraska-South Dakota-Wyoming Uranium Milling Region and Existing and Potential Uranium Milling Sites in the Black Hills Uranium Districts in South Dakota and Wyoming and in the Crow Butte Uranium District in Nebraska

Source: Modified From NRC (2009a)

Table 5.1-1. Past, Existing, and Potential Uranium Recovery Sites in the Nebraska-South Dakota-Wyoming Uranium Milling Region*

Site Name	Company/ Owner	Type	County, State	Status [†]	Approximate Distance km [mi]	Direction
North Trend	Cameco (Crow Butte Resources, Inc.)	<i>In-situ</i> uranium recovery (ISR)— Expansion	Dawes County, Nebraska	Potential site— license application received June 2007 (under NRC review)	95 [59]	SSE
Three Crow	Cameco (Crow Butte Resources, Inc.)	ISR— Expansion	Dawes County, Nebraska	Potential site	101 [63]	SSE
Marsland	Cameco (Crow Butte Resources, Inc.)	ISR— Expansion	Dawes County, Nebraska	Potential site	129 [80]	SSE
Crow Butte	Cameco (Crow Butte Resources, Inc.)	ISR— Commercial scale	Dawes County, Nebraska	Operating	105 [65]	SSE
Edgemont	U.S. Department of Energy (DOE)	Conventional uranium mill	Fall River, South Dakota	UMTRCA [†] Title II disposal site	26 [16]	SSE
Dewey-Burdock	Powertech (USA) Inc.	ISR— Commercial scale	Fall River and Custer, South Dakota	Potential site— license application submitted to NRC in August, 2009	0	—
Dewey Terrace	Powertech (USA) Inc.	ISR— Expansion	Niobrara, Wyoming	Potential site	13 [8]	WNW
Aladdin	Powertech (USA) Inc.	ISR— Expansion	Crook, Wyoming	Potential site	137 [85]	NNW

*Sources: NRC (2009a, 2012); Powertech (2009b)

[†]Status: Uranium Mill Tailings Radiation Control Act Title II sites are uranium mill processing or tailings sites that have been decommissioned. The DOE is the long-term custodian of these sites.

government agencies will monitor these potential projects, which will be discussed within the context of cumulative impacts in this SEIS based on the available information. The proposed Dewey-Burdock ISR Project is located within the Edgemont Uranium District on the southwestern flank of the Black Hills uplift. Uranium in the Edgemont Uranium District was first discovered in 1951 and mined until 1972. The district derived its name from the town of Edgemont, South Dakota, which was the closest population center to the district. Uranium was extracted from small conventional underground and surface mines in sandstone deposits within

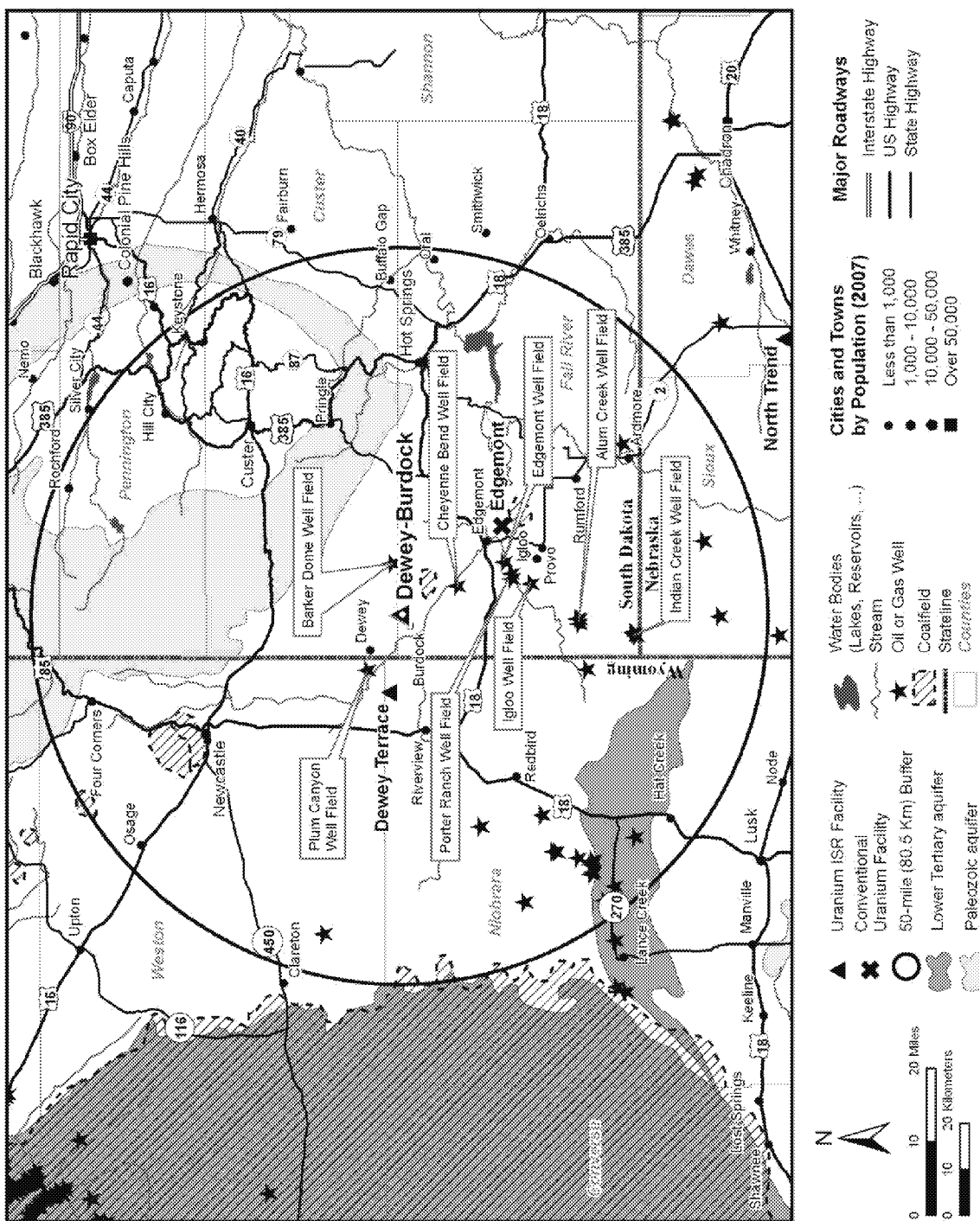


Figure 5.1-3. Oilfields, Coalfields, and Uranium Occurrences Near the Proposed Dewey-Burdock *In-Situ* Recovery Project

Sources: ESRI (2008); National Atlas of the United States (2009); WYOGCC (2012); NOGCC

the Inyan Kara Group. The uranium ore was shipped to conventional mills for processing. The only uranium mill built in South Dakota was at Edgemont. The Edgemont uranium mill processed 1.78 million metric tons [1.98 million short tons] of ore and produced 3.11 million kg [6.86 million lb] of uranium oxide as U_3O_8 before it ceased production in 1974 (SDDENR, 2010). Approximately half the ore {0.9 million metric tons [1.0 million short tons] of ore containing about 1.45 million kg [3.2 million lb] of U_3O_8 } processed at Edgemont was produced from deposits in South Dakota, and the other half came from out of state.

Most of the historic uranium mining operations within the Edgemont Uranium District were abandoned prior to the 1970s because they became uneconomical. Abandoned open pits and overburden piles associated with historic surface mining occur in the eastern portion of the proposed Dewey-Burdock ISR Project site (see Figure 3.2-3). Many of the abandoned mine sites in the Edgemont Uranium District are on USFS-managed property. In recent years USFS has reclaimed several abandoned mines in Fall River County, such as the Blue Lagoon, Gladiator, and Dead Horse mines (SDDENR, 2010).

The Tennessee Valley Authority (TVA) reclaimed the uranium mill at Edgemont from 1986 to 1989. The areas excavated during cleanup of the mill site at Edgemont were backfilled with clean soil, graded for proper drainage, and revegetated (SDDENR, 2010). Contaminated uranium mill buildings, tailings sands and slimes, and contaminated soil from the mill site and nearby areas were removed and placed in an engineered disposal site southeast of Edgemont (Figure 5.1-3) (SDDENR, 2010). The Edgemont disposal site is an UMTRCA Title II site owned and administered by U.S. Department of Energy (DOE) under a general NRC license for the custody and long-term care of uranium pursuant to 10 CFR Part 40.28.

Silver King Mines, Inc. (as Darrow Lease operator and manager for TVA) drilled approximately **4,000 exploration holes in the Dewey-Burdock area during the mid-1970s**. TVA's uranium exploration activities in the Dewey-Burdock area ended in the early 1980s and did not result in conventional uranium mining or ISR uranium extraction (Powertech, 2009a).

5.1.1.2 Coal Mining

As discussed in GEIS Section 5.3.3, active or former coal mines have not been identified in the Nebraska-South Dakota-Wyoming Uranium Milling Region (NRC, 2009a). Based on information exchanged with BLM staff during a site visit to the project area in December 2009, past resource development in the region included exploitation of small bituminous coal deposits located east and south of the proposed Dewey-Burdock ISR Project site (NRC, 2009b). This information is consistent with isolated mapped coal fields located approximately 3 km [2 mi] southeast of the proposed project and approximately 6 km [4 mi] southeast of Edgemont (Figure 5.1-3).

Unlike the sedimentary formations that host commercially extractable coal deposits in the Powder River Basin in Campbell and Converse Counties, Wyoming (i.e., the Wasatch and Fort Union Formations), the sedimentary formations beneath the counties comprising the Nebraska-South Dakota-Wyoming Uranium Milling Region do not contain thick, continuous coal beds (NRC, 2009a). SEIS Section 3.4.1 describes the lithology of sedimentary formations beneath the proposed Dewey-Burdock ISR Project area as unable to support large-scale commercial coal mining.

5.1.1.3 Oil and Gas Production

Regional oil and gas exploration, production, and pipeline construction could potentially generate cumulative impacts. Coal bed methane gas extraction removes natural gas from coal beds. This form of mining is common in the Powder River Basin located 80 km [50 mi] west of the proposed Dewey-Burdock ISR Project (see Figure 5.1-3). Because the Nebraska-South Dakota-Wyoming Uranium Milling Region does not contain commercially viable coal beds, no ongoing or planned coal bed methane production occurs within an 80-km [50-mi] radius of the proposed site (Figure 5.1-3).

The status of permitted oil and gas wells in Fall River and Custer Counties in South Dakota and Niobrara and Weston Counties in Wyoming is provided in Table 5.1-2. In Fall River County, 11 oil wells are actively producing (SDDENR, 2012a). One producing oil well, one underground injection control (UIC) permitted well for salt water disposal, and six plugged and abandoned wells are located in the Cheyenne Bend oilfield 11 km [7 mi] southeast of the proposed site (Figure 5.1-3). The 10 remaining oil wells in production are located within the Edgemont, Porter Ranch, Igloo, and Alum Creek oilfields (Figure 5.1-3). The Edgemont, Porter Ranch, and Igloo oilfields are located immediately southwest of the city of Edgemont. The Alum Creek oilfield is located approximately 23 km [14 mi] southwest of Edgemont. All Fall River County producing wells are operating within the Minnelusa Formation at depths ranging from 1,081 m [3,547 ft] at the Alum Creek oilfield to 786 m [2,580 ft] at the Cheyenne Bend oilfield (SDDENR, 2012a).

In Custer County, four oil wells are in active production (SDDENR, 2012a). All four producing wells are located at the Barker Dome oilfield located 6 km [4 mi] east of the proposed site (Figure 5.1-4). The Barker Dome oilfield also contains one UIC permitted well for salt water disposal, one well that has been converted to water supply, and 18 plugged and abandoned wells. Three of the producing oil wells at Barker Dome are located in the Minnelusa Formation at total depths of 423 to 433 m [1,387 to 1,420 ft]. The fourth producing well has a reported total depth of 588 m [1,928 ft] but a completion depth of 415 to 418 m [1,363 to 1,370 ft], which also targets the Minnelusa Formation (SDDENR, 2012a).

Weston and Niobrara Counties in Wyoming contain many more completed oil and gas production wells than Fall River and Custer Counties (Table 5.1-2). The closest producing wells to the proposed project are in the Plum Canyon oilfield 5 km [3 mi] to the northwest in Niobrara County (Figure 5.1-4) (WYOGCC, 2012). The Plum Canyon oilfield contains 4 producing wells, which are all located in the Leo Sandstone of the Minnelusa Formation at depths ranging from approximately 785 to 823 m [2,575 to 2,700 ft]. The total depths of completed wells generally increase from east to west across Weston and Niobrara Counties. For example, within the Powder River Basin, which encompasses the southwestern part of Weston County and the northwestern part of Niobrara County, many completed wells reach total depths of more than 1,981 m [6,500 ft] (WYOGCC, 2012).

Demand for drilling permits for oil and gas exploration in the vicinity of the proposed project has been low. Since 2005, South Dakota Department of Environment and Natural Resources (SDDENR) has issued 16 permits for oil and gas exploration drilling in Fall River County and no permits in Custer County (SDDENR, 2012b).

The potential effects of oil well drilling include the need to build temporary access roads to reach and construct 1.2-ha [3-ac] drill pads for each drill site (BLM, 2009a). The length of time

Table 5.1-2. Status of Permitted Oil and Gas Wells in Fall River and Custer Counties, South Dakota, and Niobrara and Weston Counties, Wyoming

County, State	Number of Plugged and Abandoned Wells	Number of Completed Wells	Number of New Permits to Drill	Permits Issued*
Fall River, South Dakota	342	11	2	396
Custer, South Dakota	72	4	0	86
Niobrara, Wyoming	1,661	383	21	2,281
Weston, Wyoming	5,252	1,568	7	7,317
Sources: SDDENR (2012a); WYOGCC (2012)				
*The "Permits Issued" category includes wells currently being drilled, wells never drilled, Underground Injection Control permitted wells, wells converted to water supply, dormant wells, and wells with expired permits				

required for drilling varies with the depth of each drillhole. Seven tracts of USFS-managed land are available for oil and gas leasing in Custer County in the vicinity of the project area (BLM, 2009a). All the tracts are located within Township 6 South, Range 1 East immediately east of Dewey (see Figure 3.2-5). Two of the tracts (SDM79010BO and SDM79010BN) border the perimeter of the proposed project (Figure 5.1-4). If lease applications were filed and approved by USFS and if the leaseholders apply for SDDENR drilling permits, it is expected that exploratory drilling for oil would be conducted.

5.1.1.4 Wind Power

Because of the proximity of currently operating wind energy projects, the potential exists for the development of wind power facilities in the Nebraska-South Dakota-Wyoming Uranium Milling Region, and these facilities would contribute to meeting forecasted electric power demands. There are wind energy projects currently operating and under construction in South Dakota, Wyoming, and Nebraska (see Table 5.1-3). **South Dakota's wind resource is 882,412 megawatts (MW), which ranks 5th in the United States (AWEA, 2012b). Wyoming's wind resource is 552,073 MW, which ranks 8th in the United States (AWEA, 2012c). Nebraska's wind resource is 917,999 MW, which ranks 4th in the United States (AWEA, 2012a). The current online capacity of wind energy projects is 784 MW in South Dakota, 1,412 MW in Wyoming, and 337 MW in Nebraska (AWEA, 2012a–c).**

Wind projects in South Dakota, Wyoming, and Nebraska range in capacity from one turbine producing 0.1 MW to 105 turbines producing 210 MW (AWEA, 2012d). The wind power projects closest to the proposed Dewey-Burdock project site are 161 km [100 mi] to the west-southwest near Glenrock in Converse County, Wyoming. Wind power projects in Wyoming are located primarily in the southeastern part of the state (AWEA, 2012c). In South Dakota, wind power projects are located in the central and eastern parts of the state more than 241 km [150 mi] from the proposed Dewey-Burdock site (AWEA, 2012b). Wind power projects in Nebraska are located primarily in the north-central and eastern parts of the state and are also more than 241 km [150 mi] from the proposed Dewey-Burdock site (AWEA, 2012a).

The Dewey-Burdock Wind Association, LLC is a landowner group formed to explore the possibility of a wind farm (referred to herein as the Dewey-Burdock Wind Project) on privately owned land within and surrounding the proposed Dewey-Burdock ISR Project site (Powertech, 2010). Land designated as having potential for wind power electrical generation is shown in Figure 5.1-4. The Dewey-Burdock Wind Project is in the conceptual phase.

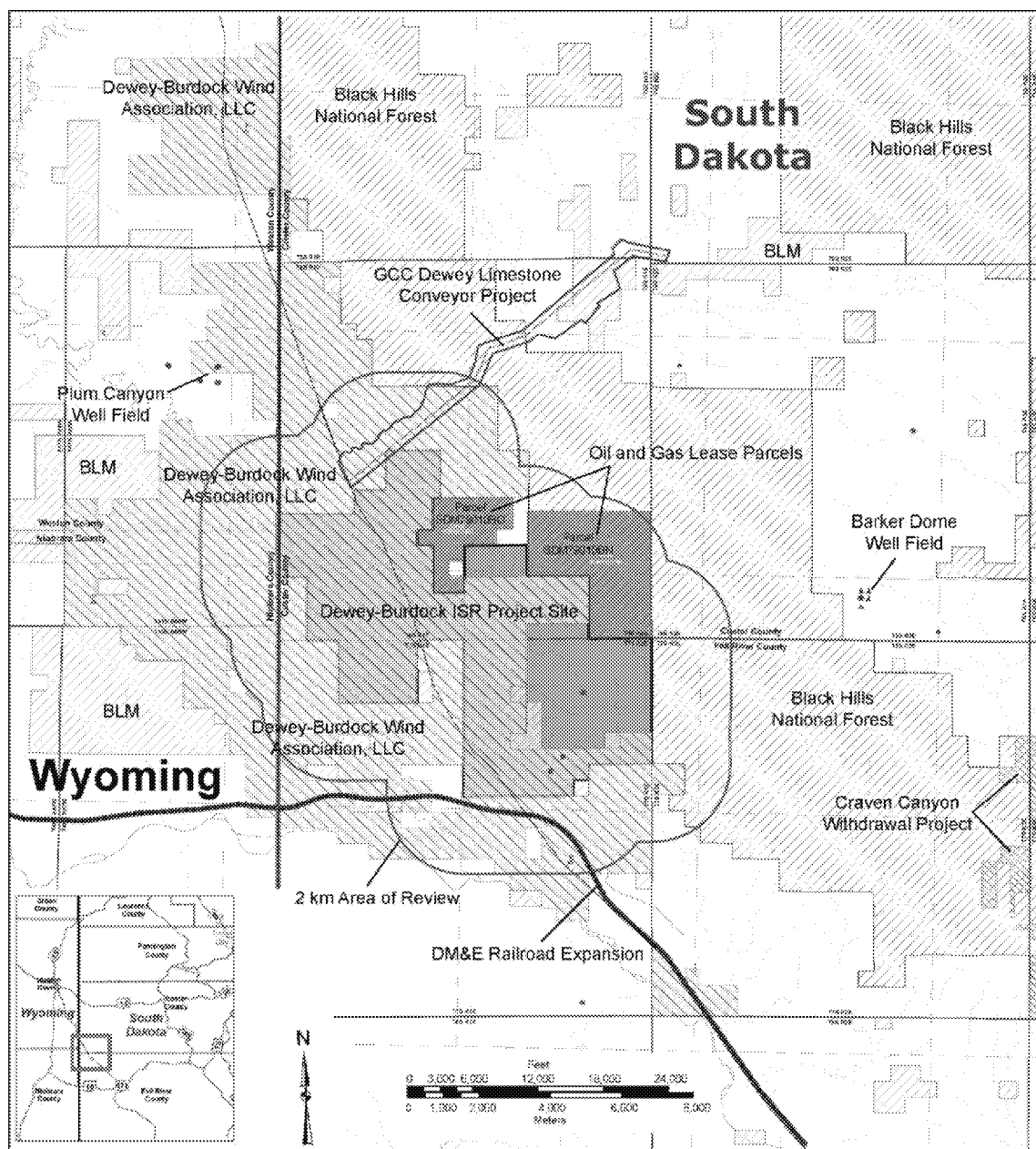


Figure 5.1-4. Existing, Pending, and Future Projects Within and in the Vicinity of the Proposed Dewey-Burdock *In-Situ* Recovery Project
 Source: Modified from Powertech (2010)

Table 5.1-3. Summary of Wind Energy in South Dakota, Wyoming, and Nebraska

State	Current Online Capacity (MW)	Capacity Added in 2010 (MW)	Wind Resource (MW at 80 m Hub Height)	U.S. Wind Resource Rank
South Dakota	784	396	882,412	5 th
Wyoming	1,412	311	552,073	8 th
Nebraska	337	60	917,999	4 th

Source: AWEA, 2012a-c

The development of wind energy projects in the Nebraska-South Dakota-Wyoming Uranium Milling Region is limited by availability of transmission lines to end users. Existing transmission capacity for wind-generated power is low, and there are no plans to expand existing or construct new transmission corridors in the Nebraska-South Dakota-Wyoming Uranium Milling Region (AWEA, 2012d).

5.1.1.5 Transportation Projects

Dewey Conveyor Project

In 2007, GCC Dacotah Inc. submitted an Application for Transportation and Utility Systems and Facilities on Federal Lands for the Dewey Conveyor Project. If constructed, the Dewey Conveyor Project will transport limestone mined from the Minnekahta Limestone to a rail load-out facility near Dewey, South Dakota (BLM, 2009a). The conveyor project lies north of the Dewey-Burdock Project area in portions of Township 5 South, Range 1 East, Section 36; Township 6 South, Range 1 East, Sections 1, 2, 9, 10, 11, 12, 15, 16, 17, 18, 19, and 20; and Township 5 South, Range 2 East, Section 31 (Figure 5.1-4). The area proposed for limestone quarrying operations is several kilometers [miles] north, where the Minnekahta Limestone lies at or close to the ground surface (BLM, 2009a). The town of Dewey is located along the existing Burlington Northern Santa Fe (BNSF) Railroad transportation corridor.

The proposed conveyor route crosses BLM-administered public lands, USFS-administered **National Forest System land**, and **GCC Dacotah Inc.'s privately owned land (Figure 5.1-4)**. The project anticipates construction of an elevated, enclosed conveyor 10.6-km [6.6-mi] in length, a one-lane service road, and access points (BLM, 2009a). The elevated conveyor would be about 5 m [16 ft] high and would provide a minimum vertical clearance of 2 m [6 ft] beneath the structure. Depending on terrain, structural supports would be required at intervals of 7.6 to 12 m [25 to 40 ft]. BLM and USFS will evaluate the application and decide whether to approve it, grant GCC Dacotah Inc. a right-of-way (ROW) to allow the conveyor to cross federal lands, and issue a special use permit. BLM and USFS will decide whether stipulations or mitigation measures must be attached to the ROW grant and special use permit.

Powder River Basin Expansion Project

The Dakota Minnesota and Eastern (DM&E) Railroad filed an application to construct the Powder River Basin (PRB) Expansion Project with the federal Surface Transportation Board (STB) in February 1998. The project seeks approval to construct and operate a new rail line and associated facilities in east-central Wyoming and southwest South Dakota (STB, 2001). If approved and completed, the project will add rail coal-hauling capacity and establish a dedicated, direct route to transport coal from the Powder River Basin to Midwest markets. **DM&E's proposed rail expansion will extend DM&E's existing northern line near Wall, South Dakota, southwest to Edgemont, then northwest to Burdock, and finally west into Wyoming.** The extension will add 418 km [260 mi] of rail line and connect the northern DM&E line to operating coal mines located south of Gillette, Wyoming (see Figure 5.1-5). The proposed rail expansion route is south of the proposed Dewey-Burdock ISR Project site (see Figure 5.1-4).

At this time, Canadian Pacific—DM&E's parent company—has not yet decided whether to build the extension. The decision to build is contingent on several factors: (i) acquiring the necessary ROW to build the line, (ii) executing agreements with Powder River Basin mining companies for the right of DM&E to operate loading tracks and facilities, (iii) securing

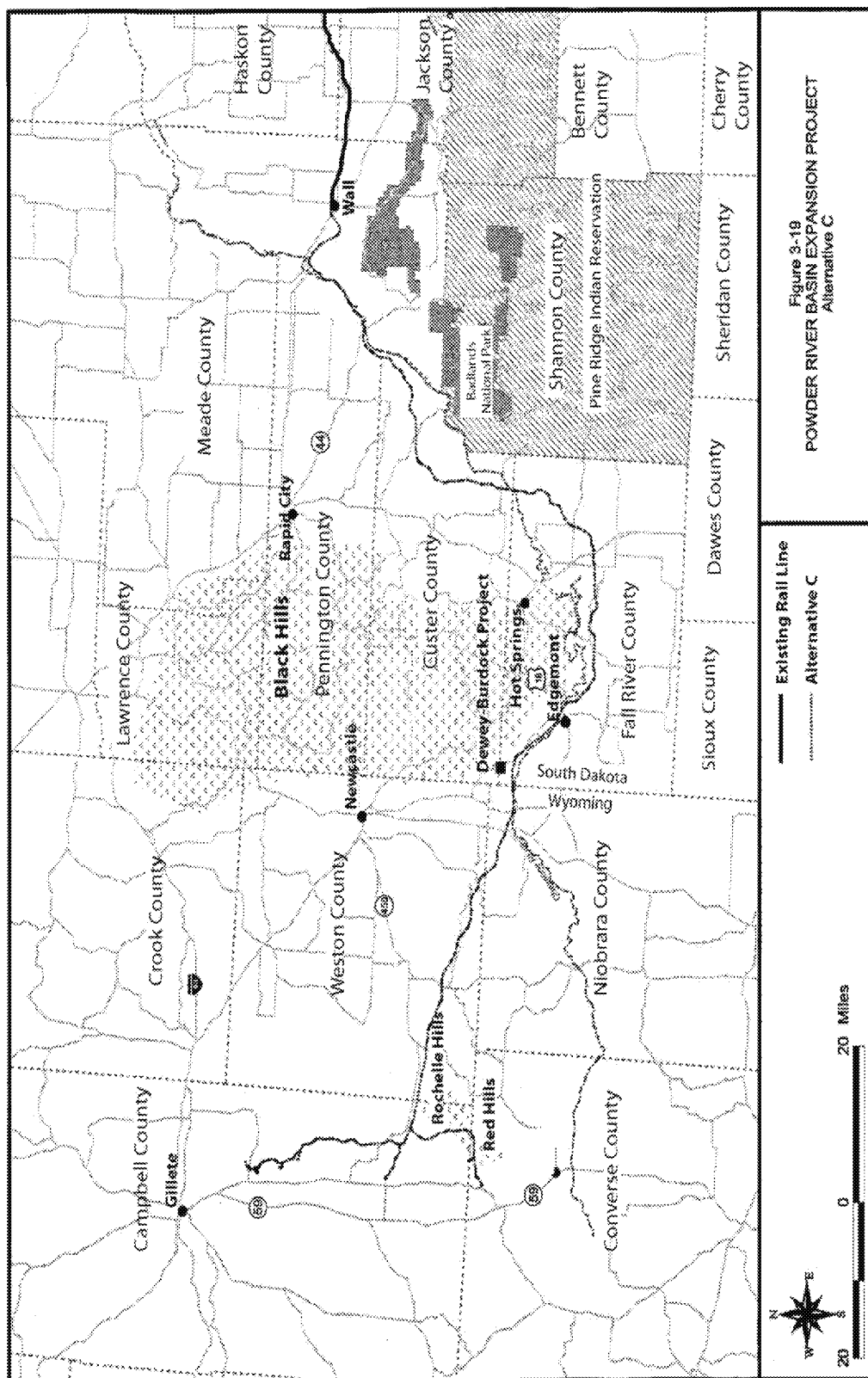


Figure 5.1-5. Map Showing Proposed New Rail Construction (Alternative C) for Dakota Minnesota and Eastern Railroad Powder River Basin Expansion Project From Wall, South Dakota, West Into the Powder River Basin of Wyoming
Source: Modified from STB (2001)

contractual commitments from prospective coal shippers to ensure revenues from the proposed line are economical, and (iv) arranging financing for the project.

5.1.1.6 Other Mining

Gold mining is not extensive in South Dakota; however, gold is the leading mineral commodity by dollar value. Only Wharf Resources Inc. actively mines gold in the state, and it holds four permits for gold operations in the northern Black Hills (Holm, et al., 2008). Wharf Resources is the only company to report silver production, which is a byproduct of its gold recovery process. Sand and gravel are the major nonmetallic mineral commodities produced in South Dakota. Sand and gravel are quarried in every county in South Dakota, mainly for road construction projects. Limestone is quarried in the Black Hills, primarily for the production of cement for use in construction projects.

5.1.1.7 Environmental Impact Statements as Indicators of Past, Present, and Reasonably Foreseeable Future Actions

Indicators of present and reasonably foreseeable future actions are draft and final EISs federal agencies prepare within a recent time period. Using information in GEIS Section 5.2.2 (NRC, 2009a) and other publicly available information, several EISs were identified for the Nebraska-South Dakota Wyoming Uranium Milling Region (see Table 5.1-4). A majority of EISs in Table 5.1-4 are related to resource management actions in the Black Hills National Forest (BHNF) or associated management units. These EISs are for actions that are focused on improving natural resource conditions and reducing adverse impacts from various human-related activities. Three exceptions are the draft EIS that BLM prepared for the Dewey Conveyor Project (BLM, 2009a), the final programmatic EIS that BLM prepared for wind energy development on BLM-administered lands in the western United States (BLM, 2005), and the final EIS that the STB prepared for the DM&E proposal to build the PRB Rail Expansion Project (STB, 2001).

5.1.2 Methodology

In calculating and assessing potential cumulative impacts, the NRC staff developed a methodology that follows CEQ guidance (see NRC, 2009a and CEQ, 1997).

1. Identify the potential environmental impacts of the federal action, and evaluate the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions for each resource area. Potential environmental impacts are discussed and analyzed in Chapter 4 of this SEIS.
2. Identify the geographic scope for the analysis for each resource area. This scope will vary from resource area to resource area, depending on the geographic extent to which the potential impacts of the resource area could be at issue.
3. Identify the timeframe for assessing cumulative impacts. The NRC staff use the period from 2009 to 2030 for identifying and assessing cumulative effects. The timeframe begins with NRC acceptance of the application for an NRC source material license to operate the Dewey-Burdock ISR Project in October 2009. The cumulative impact analysis timeframe ends in 2030, the date estimated for license termination after completion of the decommissioning period (see Figure 2.1-1).

Table 5.1-4. Draft and Final National Environmental Policy Act Documents Related to the Nebraska-South Dakota-Wyoming Uranium Milling Region

November 19, 2001	Surface Transportation Board (STB), Final Environmental Impact Statement (EIS), Dakota, Minnesota and Eastern Railroad Corporation Powder River Basin Expansion Project
June 2005	U.S. Bureau of Land Management (BLM), Final Programmatic EIS on Wind Energy Development on BLM-Administered Lands in the Western United States
June 3, 2005	U.S. Forest Service (USFS), Final EIS, Dean Project Area, Proposal To Implement Multiple Resource Management Actions, Black Hills National Forest (BHNF), Bearlodge Ranger District, Sundance, Crook County, Wyoming (resource management)
August 12, 2005	USFS, Final EIS, Black-Tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units, Implementation, Dawes, Sioux, Blaine, Cherry, Thomas Counties, NE, and Custer, Fall River, Jackson, Pennington, Jones, Lyman, Stanley Counties, South Dakota (resource management—prairie dog)
October 28, 2005	National Park Service, Draft EIS, Badlands National Park/North Unit General Management Plan, Implementation, Jackson, Pennington, and Shananon Counties, South Dakota (resource management)
November 20, 2005	USFS, Final EIS, Deerfield Project Area, Proposal To Implement Multiple Resource Management Actions, Mystic Ranger District, BHNF, Pennington County, South Dakota (resource management)
November 25, 2005	USFS, Final EIS, Bugtown Gulch Mountain Pine Beetle and Fuels Projects, To Implement Multiple Resource Management Actions, BHNF, Hell Canyon Ranger District, Custer County, South Dakota (resource management)
October 31, 2005	USFS, Final EIS, Black Hills, National Forest Land and Resource Management Plan Phase II Amendment, Proposal To Amend the 1997 Land and Resource Management Plan, Custer, Fall River, Lawrence, Meade, Pennington Counties, South Dakota; Crook and Weston Counties, Wyoming (resource management)
February 3, 2006	USFS, Final EIS, Black-Tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units, Implementation, Dawes, Sioux, Blaine, Cherry, Thomas Counties, Nebraska, and Custer, Fall River, Jackson, Pennington, Jones, Lyman, Stanley Counties, South Dakota (resource management—prairie dog)
May 12, 2006	USFS, Final SEIS, Dean Project Area, Proposal To Implement Multiple Resource Management Actions, New Information To Disclose Direct, Indirect, and Cumulative Environmental Impacts, BHNF, Bearlodge Ranger District, Sundance, Crook County, Wyoming (resource management)
June 1, 2007	USFS, Final EIS, Norwood Project, Proposal To Implement Multiple Resources Management Actions, BHNF, Hell Canyon Ranger District, Pennington County, South Dakota, and Weston, Crook Counties, Wyoming (resource management)

Table 5.1-4. Draft and Final National Environmental Policy Act Documents Related to the Nebraska-South Dakota-Wyoming Uranium Milling Region (Cont'd)

June 8, 2007	USFS, Draft EIS, Nebraska and South Dakota Black-Tailed Prairie Dog Management, To Manage Prairie Dog Colonies in an Adaptive Fashion, Nebraska National Forest and Associated Units, Including Land and Resource Management Plan Amendment 3, Dawes, Sioux, Blaine Counties, Nebraska, and Custer, Fall River, Jackson, Pennington, Jones, Lyman, Stanley Counties, South Dakota (resource management—prairie dog)
June 29, 2007	USFS, Final EIS, Mitchell Project Area, Proposal To Implement Multiple Resource Management Actions, Mystic Ranger District, BHNF, Pennington County, South Dakota (resource management)
September 14, 2007	USFS, Final EIS, Citadel Project Area, Proposal To Implement Multiple Resource Management Actions, Northern Hills Ranger District, BHNF, Lawrence County, South Dakota (resource management)
February 22, 2008	USFS, Draft EIS, Upper Spring Creek Project, Proposal To Implement Multiple Resource Management Actions, Mystic Ranger District, BHNF, Pennington County, South Dakota (resource management)
January 2009	USFS/BLM, Draft EIS, Dewey Conveyor Project, Whether or Not to Issue Special Use Permit For 6.6 Mile Conveyor Along Dewey Road and Limestone Claims Northeast of Dewey, Custer County, South Dakota
May 7, 2010	USFS, Final EIS and Record of Decision, Black Hills National Forest Travel Management Plan, To Designate a Motorized Travel System, Lawrence, Meade, Pennington, Custer, and Fall River Counties, South Dakota; and Crook and Weston Counties, Wyoming
January 27, 2012	USFS, Final EA and Decision Notice/Finding of No Significant Impact, Southern Black Hills Water System Argyle Road Service Area Special Use Permit, Approve Occupancy of National Forest System Lands by Proponent to Provide Potable Water to Customers Along Argyle Road, BHNF Custer County, South Dakota
December 10, 2012	USFS, Final EIS and Record of Decision, Mountain Pine Beetle Response Project, Black Hills National Forest, To Implement Multiple Resource Management Actions to Reduce Threat to Ecosystem Components, Including Forest Resources, from the Existing Insect and Disease (Mountain Pine Beetle) Epidemic and Help Protect Local Communities and Resources from Large Scale, Severe Wildfire, Lawrence, Meade, Pennington, Custer, and Fall River Counties, South Dakota; and Crook and Weston Counties, Wyoming (resource management)

NRC source material licenses for ISR facilities are typically granted for a 10-year period. The proposed Dewey-Burdock ISR Project has an estimated 17-year operational lifespan (see Figure 2.1-1). If NRC grants a source material license, the applicant must apply for license renewal before the initial license period expires to continue operations.

4. Identify ongoing and prospective projects and activities that take place or may take place in the area surrounding the project site. These projects and activities are described in Section 5.1.1 of this chapter.
5. Assess the cumulative impacts for each resource area from the proposed action and reasonable alternatives, and other past, present, and reasonably foreseeable future actions. This analysis would take into account the environmental impacts of concern identified in Step 1 and the resource-area-specific geographic scope identified in Step 2.

The following terms describe the level of cumulative impact:

- SMALL:** The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource considered.
- MODERATE:** The environmental effects are sufficient to alter noticeably, but not destabilize, important attributes of the resource considered.
- LARGE:** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource considered.

The NRC staff recognize that many aspects of the activities associated with the proposed Dewey-Burdock ISR Project would have SMALL impacts on the affected resources. It is possible, however, that an impact that may be SMALL by itself, but could result in a MODERATE or LARGE cumulative impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline. The NRC staff determined the appropriate level of analysis that was merited for each resource area potentially affected by the proposed action and alternatives. The level of analysis was determined by considering the impact level to that resource, as described in Chapter 4, as well as the likelihood that the quality, quantity, and stability of the given resource could be affected.

Table 5.1-5 summarizes the cumulative impacts of the proposed Dewey-Burdock Project on environmental resources NRC staff identified and analyzed. The cumulative impacts are based on analyses the NRC staff conducted and take into account the other past, present, and reasonably foreseeable activities identified in SEIS Section 5.1.1.

Table 5.1-5. Cumulative Impacts on Environmental Resources

Resource Category	Cumulative Impacts	Comment
Land Use	MODERATE	The proposed project will have a SMALL incremental impact when added to the MODERATE cumulative impacts to land use.
Transportation	MODERATE	The proposed project will have a SMALL incremental impact when added to the MODERATE cumulative impacts to transportation.

Table 5.1-5. Cumulative Impacts on Environmental Resources (Cont'd)

Resource Category	Cumulative Impacts	Comment
Geology and Soils	MODERATE	The proposed project will have a SMALL incremental impact when added to the MODERATE cumulative impacts to geology and soils.
Water Resources		
Surface Waters and Wetlands	MODERATE to LARGE	The proposed project will have a SMALL incremental impact when added to the MODERATE to LARGE cumulative impacts to surface waters and wetlands.
Groundwater	MODERATE	The proposed project will have a SMALL incremental impact when added to the MODERATE cumulative impacts on groundwater.
Ecological Resources		
Terrestrial Ecology	MODERATE	The proposed project will have a SMALL incremental impact when added to the MODERATE cumulative impacts to terrestrial ecological resources.
Aquatic Ecology	SMALL	The proposed project will have a SMALL incremental impact when added to the SMALL cumulative impacts to aquatic ecological resources.
Threatened and Endangered Species	MODERATE	The proposed project will have a SMALL incremental impact when added to the MODERATE cumulative impacts to threatened and endangered species.
Air Quality	SMALL to MODERATE	The proposed project will have a SMALL to MODERATE incremental impact on air quality when added to the MODERATE cumulative impacts.
Noise	MODERATE	The proposed project will have a SMALL incremental impact on noise when added to the MODERATE cumulative impacts.

Table 5.1-5. Cumulative Impacts on Environmental Resources (Cont'd)

Resource Category	Cumulative Impacts	Comment
Historic and Cultural Resources	MODERATE to LARGE	The proposed project will have a SMALL to LARGE incremental impact on historic and cultural resources when added to the MODERATE to LARGE cumulative impacts.
Visual and Scenic Resources	MODERATE to LARGE	The proposed project will have a SMALL incremental impact on visual and scenic resources when added to the MODERATE to LARGE cumulative impacts to the viewshed.
Socioeconomics	SMALL to MODERATE	The proposed project will have a SMALL to MODERATE incremental impact on socioeconomic resources when added to the SMALL to MODERATE cumulative impacts.
Environmental Justice	SMALL	The proposed project will have a SMALL incremental impact on environmental justice when added to the SMALL cumulative impacts.
Public and Occupational Health and Safety	SMALL	The proposed project will have a SMALL incremental impact on public and occupational health when added to the SMALL cumulative impacts.
Waste Management	SMALL to MODERATE	The proposed project will have a SMALL to MODERATE incremental impact on waste management when added to the SMALL to MODERATE cumulative impacts.

5.2 Land Use

NRC staff assessed cumulative impacts on land use within a 16-km [10-mi] radius of the proposed Dewey-Burdock ISR Project permit boundary, which includes parts of Custer and Fall River Counties, South Dakota, and Weston and Niobrara Counties, Wyoming. Land use impacts result from interruption to, reduction, or impedance of livestock grazing areas, open wildlife areas, and land access. The assessment of cumulative impacts on land use beyond 16 km [10 mi] was not undertaken, because at this distance the impacts on land use from the proposed project will be minimal. The timeframe for the analysis of cumulative impacts is 2009 to 2030, as described in SEIS Section 5.1.2.

The majority of land within the 16-km [10-mi] radius of the proposed project is in private ownership; however, USFS manages tracts of forest, grassland, and recreational land in the vicinity (see Figures 5.1-1 and 5.1-4). The BHNH borders the project to the north and east, and the Buffalo Gap National Grassland is 4.8 km [3 mi] south of the project. USFS-managed lands provide recreational activities, including camping, hiking, fishing, and hunting.

BLM-administered lands are distributed among other federal and private lands to the north, west, and south of the proposed project site. Cattle grazing is the predominant land use on both public and private rangeland.

Short-term cumulative impacts from the loss of rangeland include a decrease in the area for foraging, temporary loss of animal unit months (AUMs), and temporary loss of water-related range improvements (e.g., improved springs, water pipelines, stock ponds). These impacts would be reduced after an area had been reclaimed. Long-term cumulative impacts result from the permanent loss of forage and forage/cropland productivity in un-reclaimed areas. Other impacts could include dispersal of noxious and invasive weed species both within and beyond areas where the surface had been disturbed, which reduces the area of desirable forage by livestock. The proposed Dewey-Burdock ISR Project will disturb 98 ha [243 ac] if Class V deep injection wells are used to dispose of liquid wastes or 566 ha [1,398 ac] if land application is used to dispose of liquid wastes (see SEIS Section 4.2.1). These amounts of land are small in comparison to the available grazing land within the land use study area {i.e., land within a 16-km [10-mi] radius of the proposed project site}. These amounts of land will also be fenced from grazing at different times over the life of the project.

Past, ongoing, and future conventional uranium mines and ISR facilities in the vicinity of the proposed Dewey-Burdock ISR Project and within the broader regional area are described in SEIS Section 5.1.1. The Crow Butte ISR facility lies 105 km [65 mi] to the south-southeast in Dawes County, Nebraska, and is the closest operational ISR facility to the Dewey-Burdock site. Three ISR expansion or satellite projects are in the planning or licensing stages in the immediate vicinity of the Crow Butte ISR facility (North Trend, Three Crow, and Marsland) (see SEIS Section 5.1.1.1).

In the land use study area, the applicant has identified a potential ISR project at Dewey Terrace. The Dewey Terrace project would be located approximately 13 km [8 mi] west of the proposed project area in Weston and Niobrara Counties, Wyoming (Figure 5.1-3). If developed, the potential Dewey Terrace project will have impacts on land use (i.e., surface disturbances and fencing to restrict livestock grazing) within the land use study area. To assess the projected land area that will be affected by the development of the potential Dewey Terrace project, the NRC staff assumed that approximately the same area affected by the proposed action {98 to 566 ha [243 to 1,398 ac]} will also apply to other potential ISR projects. Like the proposed Dewey-Burdock ISR Project, this amount of land area is small in comparison to the land use study area.

Land disturbed by past conventional surface mining is present in the eastern part of the proposed Dewey-Burdock site, where abandoned open mine pits and mine waste overburden piles are found (see SEIS Section 5.1.1.1). Wellfields are planned within these areas (see Figure 3.2-3). If wellfields in the mine waste areas are constructed and operated, additional land disturbance and access restrictions will occur.

Impacts on land use from oil and gas drilling include building temporary access roads and constructing 1.2-ha [3-ac] drill pads for each drill site (BLM, 2009a). There are no active oil- and gas-producing wells within the proposed Dewey-Burdock permit area. SEIS Section 3.2.3 identifies three plugged and abandoned oil and gas wells in the Burdock portion of the site in Fall River County. There are few producing oil wells in the land use study area {i.e., within a 16-km [10-mi] radius of the proposed Dewey-Burdock project area}. The Barker Dome oilfield in Custer County and the Plum Canyon oilfield in Weston County each have four producing oil wells (see Figures 5.1-3 and 5.1-4). The Cheyenne Bend oilfield in Fall River County has one

producing oil well (see Figure 5.1-3). In addition, demand for oil and gas leasing in the vicinity of the proposed project is low (see SEIS Section 5.1.1.3). The majority of active oil and gas development in the region takes place on USFS-managed land (see Figure 5.1-3). This development occurs west and south of Edgemont and in the PRB, which is more than 80 km [50 mi] west of the proposed project (see Figure 5.1-3).

Ongoing and proposed coal bed methane operations and wind energy operations in the region are located in the Powder River Basin west of the cumulative impacts land use study area (see SEIS Sections 5.1.1.2 and 5.1.1.4). Sedimentary formations hosting potential coal bed methane reserves are not present in the land use study area. The nearest existing wind power projects to the land use study area are located approximately 161 km [100 mi] to the west-southwest near Glenrock in Converse County, Wyoming. The potential Dewey-Burdock Wind Project is in the conceptual phase and would be located within and surrounding the proposed Dewey-Burdock site (Figure 5.1-4). If developed, the wind project will be constructed on ridges to exploit the best wind conditions rather than low areas where uranium deposits within and in the vicinity of the proposed project tend to be located (e.g., see Figure 4.5-1). Development of wind energy projects is generally compatible with other land uses, including livestock grazing, recreation, and oil and gas production activities (BLM, 2005).

Two proposed transportation projects are within the cumulative impacts land use study area: the **GCC Dacotah Inc.'s Dewey Conveyor Project** and the **DM&E PRB Expansion Project** (see SEIS Section 5.1.1.5).

Lands along the route of the Dewey Conveyor Project are owned by GCC Dacotah and private landowners or are public lands managed by BLM or USFS. About 16.2 ha [40 ac] of land disturbance will be created during the 1-year conveyor construction phase, resulting in temporary loss of forage. After construction, about 6.5 ha [16 ac] of land disturbance will remain, resulting in long-term losses in available forage. These long-term losses will be confined to the conveyor and maintenance road footprints. The conveyor will be designed to allow livestock and wildlife to freely cross beneath. Adequate signage will be posted to prevent potential trespass by GCC Dacotah employees, and GCC Dacotah employees will be trained regarding property boundaries. The conveyor project is designed so as not to interfere with the operation and maintenance of existing electric transmission and oil and gas distribution lines. In addition, changes in road easements and other infrastructure are not expected. (BLM, 2009a)

The proposed DM&E PRB Expansion Project will have a significant impact on use of private agricultural land by farmers and ranchers, grazing allotments leased by ranchers on federal lands, and mineral and mining rights on federal lands in western South Dakota and Wyoming. State-owned land and utility corridors are also expected to have impacts. Construction of the rail extension will involve direct and indirect takings of privately held land and the destruction of wells, windmills, corrals, fencing, outbuildings, irrigation systems, fire prevention and suppression systems, and other capital improvements. Access roads, hauling roads, and borrow pits will be built. DM&E will be required to mitigate adverse environmental impacts to private agricultural and ranch lands, federal lands, state lands, and utility corridors. DM&E will negotiate these mitigation measures with landowners and federal and state agencies. DM&E will be required to restore all federal, state, and privately held agricultural lands disturbed by the project to pre-construction conditions as promptly and fully as possible. (STB, 2001)

The NRC staff have determined that the cumulative impact on land use within the land use study area (i.e., Fall River, Custer, Weston, and Niobrara Counties) resulting from all past, present, and reasonably foreseeable future actions is MODERATE. This finding is based on the

assessment of existing and potential impacts on land use within the study area from the following actions:

- Land disturbance from past conventional surface mining in the eastern portion of the proposed Dewey-Burdock site
- Surface disturbance and restrictions on livestock grazing and recreational activities (e.g., hunting and off-road vehicle use) from development of potential ISR projects, such as the potential Dewey Terrace project
- Land disturbance from development of the proposed Dewey Conveyor Project
- Direct and indirect taking of privately held land tied to construction of the DM&E PRB Expansion Project, with resulting destruction of wells, windmills, corrals, fencing, outbuildings, irrigation systems, fire prevention and suppression systems, and other capital improvements

Other ongoing and reasonably foreseeable future actions are not expected to have a significant impact on land use within the cumulative impacts study area. There are few producing oil wells within the study area, and demand for oil and gas leasing is low. Coal bed methane reserves are not present within the study area. Potential wind energy projects, such as the Dewey-Burdock Wind Project, are generally compatible with the primary land uses in the study area, including livestock grazing, recreation, and wildlife habitat conservation (BLM, 2005).

The NRC staff conclude the proposed Dewey-Burdock ISR Project will have a **SMALL** incremental effect on land use after evaluating its effects and those of all the other past, present, and reasonably foreseeable future actions in the land use study area. As discussed in SEIS Section 4.2.1, land use impacts related to the proposed Dewey-Burdock ISR Project will be **SMALL** for all stages of the project lifecycle. The estimated land disturbance of 98 to 566 ha [243 to 1,398 ac] for the proposed action is a small amount of land in comparison to the cumulative impacts study area. About this same amount of land will be fenced over the life of the proposed project to restrict livestock grazing and public access to the ISR facilities and to infrastructure, wellfields, and potential land application areas. Fencing around wellfields will be temporary. As wellfield production ends, fencing will be removed and the land reclaimed in accordance with applicable BLM and SDDENR requirements. At the end of operations, the applicant will decommission the site and restore the land to its previous use (with the possible exception of access roads that land owners may request to remain) in accordance with an NRC-approved decommissioning plan (see SEIS Section 2.1.1.1.5).

5.3 Transportation

Cumulative impacts on transportation systems of Custer and Fall River Counties, South Dakota, and Weston and Niobrara Counties, Wyoming, were identified and evaluated. Local highways, **existing county roads, and access roads were the focus of this analysis over the 2009–2030 timeframe** (see SEIS Section 5.1.2 for the estimated operating life of the facility).

As described in SEIS Section 4.3.1, the impacts to the principal access road to the Dewey-Burdock site (Dewey Road) and heavily traveled regional and local highways will be **SMALL** during all phases of the proposed Dewey-Burdock ISR Project. As described in SEIS

Section 4.3.1, daily traffic on Dewey Road will increase by 42 percent during the construction phase and by 24 percent during the operations phase of the proposed project. The increase in traffic will incrementally accelerate the degradation of the road surface, increase fugitive dust emissions, and increase the potential for traffic accidents and wildlife or livestock kills.

Secondary access roads connecting Dewey Road with the proposed plant facilities and the plant facilities within the wellfields will also experience long-term transportation impacts. However, the transportation impacts to secondary access roads are not considered permanent, because the land will ultimately be returned to its natural condition when production and decommissioning are complete (Powertech, 2009b).

In the cumulative impacts study area, transportation will be impacted by ongoing and reasonably foreseeable future activities. These include impacts to livestock grazing, uranium exploration and mining, and oil and gas exploration and development. The many unimproved, two-track dirt roads and one lane gravel roads in the cumulative impacts transportation study area were constructed to access livestock grazing lands, to facilitate natural resource exploration and extraction, to provide access to recreational areas, and for off-road vehicle recreational activities. County roads in the transportation study area have intermittently provided access for uranium exploration and mining, as well as oil and gas exploration activities, since the mid-1970s. Reasonably foreseeable future uranium, oil, and gas exploration will result in additional trucks and heavy equipment using existing county roads. For example, the potential Dewey Terrace uranium project would be located 13 km [8 mi] west of the Dewey-Burdock ISR Project area in Weston and Niobrara Counties, Wyoming (see SEIS Section 5.1.1.1). If developed, the Dewey Terrace project may contribute to additional traffic on Dewey Road from commuting workers, construction and operations deliveries, and yellowcake and byproduct transport. These future activities may require or benefit from the construction of new road surfaces or the improvement of existing county roads, including Dewey Road.

As noted in SEIS Section 5.1.1, other reasonably foreseeable future projects, such as wind energy and transportation projects, contribute to the analysis of cumulative impacts.

Wind energy projects will impact transportation on local roads; however, these impacts would be temporary. During the 1- to 2-year construction period for a wind energy project, the vehicles of 100 to 150 workers and vehicles used to transport construction equipment, blades, turbine components, and other materials to the site will cause a relatively short-term increase in the use of local roadways. Shipments of materials, such as gravel, concrete, and water, are not expected to significantly affect local primary and secondary road networks. Shipments of overweight and/or oversized loads are expected to cause temporary disruptions on primary and secondary roads used to access construction sites. It is possible that local roads might require fortification of bridges and removal of obstructions to accommodate overweight and oversized shipments. Once completed, wind energy projects will require a relatively low number of workers to operate and maintain. For example, the operation and maintenance of a 180-MW capacity wind energy project with about 150 turbines will require 10 to 20 workers. Consequently, transportation activities will be limited to a small number of daily trips by pickup trucks, medium-duty vehicles, or personal vehicles. Shipments of large components required for equipment replacement in the event of major mechanical breakdowns are expected to be infrequent. Transportation activities during site decommissioning will be similar to those during construction but will involve a much smaller workforce. Heavy equipment will be required for dismantling turbines and towers, breaking up tower foundations, and regrading and recontouring the site. (BLM, 2005)

The proposed Dewey Conveyor will not impact transportation on heavily traveled regional and local roadways but will temporarily impact transportation on Dewey Road. Dewey Road is the primary transportation corridor along the 10.6 km [6.6 mi] length of the proposed conveyor alignment (Figure 5.3-1). Dewey Road continues both north and south of the proposed conveyor project. The construction workforce for the conveyor project will come primarily from Hot Springs, Custer, and Edgemont and use Dewey Road to access the site from the south. Construction of the conveyor will involve approximately 50 workers and take 1 construction season. During construction, deliveries and commuting workers will increase traffic counts on Dewey Road between Edgemont and Dewey. Following construction, approximately 12 workers will oversee quarrying, transport, and load-out operations related to the project. Due to the short duration of construction and relatively low number of workers needed to operate the conveyor operation, the proposed Dewey Conveyor Project is not expected to have a significant impact on transportation in the cumulative impacts study area. (BLM, 2009a)

The proposed DM&E PRB Expansion Project will have temporary impacts on transportation in western South Dakota and Wyoming. The project will require the construction of temporary roads to access the rail line ROW. In the cumulative impacts study area for transportation, the rail line will parallel the BNSF rail line from Edgemont to Burdock before turning west toward Wyoming (see Figure 5.1-4). Therefore, the project will have an impact on Dewey Road from commuting workers and deliveries of equipment and materials during construction of the rail line. DM&E has proposed mitigation measures as part of the proposed PRB Expansion Project to address potential adverse impacts to transportation. To the extent possible, DM&E will confine all project-related construction traffic to a temporary access road within the ROW or established public roads. Any temporary access roads constructed outside the rail line ROW will be removed and the land reclaimed upon completion of construction. As a result of road closures after construction and during operation of railyards, DM&E will provide or develop alternative access for the safe movement of farm and ranch equipment and livestock to fields and pastures. (STB, 2001)

The NRC staff have determined that the cumulative impact on transportation within the transportation study area resulting from all past, present, and reasonably foreseeable future actions is MODERATE. Regional and local highways in the transportation study area have sufficient capacity to accommodate the traffic of ongoing actions and increases in traffic from other reasonably foreseeable future actions. However, county roads will be impacted. County roads have been used to access uranium exploration and mining and oil and gas exploration activities in the transportation study area since the mid-1970s. Reasonably foreseeable future uranium, oil, and gas exploration and development in the transportation study area will result in additional trucks and heavy equipment using existing county roads. Construction and operation of potential wind energy and transportation projects will also impact county roads in the transportation study area. For example, the potential Dewey-Burdock Wind Project and the proposed Dewey Conveyor Project and DM&E PRB Expansion Project would utilize Dewey Road. Transportation impacts will be most significant during the construction phase of wind energy and transportation projects because construction activities involve more workers and deliveries of materials and equipment.

The NRC staff have concluded that the proposed Dewey-Burdock ISR Project will have a SMALL incremental effect on transportation when considered with all the other past, present, and reasonably foreseeable future actions in the transportation study area. As described in SEIS Section 4.3.1, increased vehicular traffic associated with the proposed

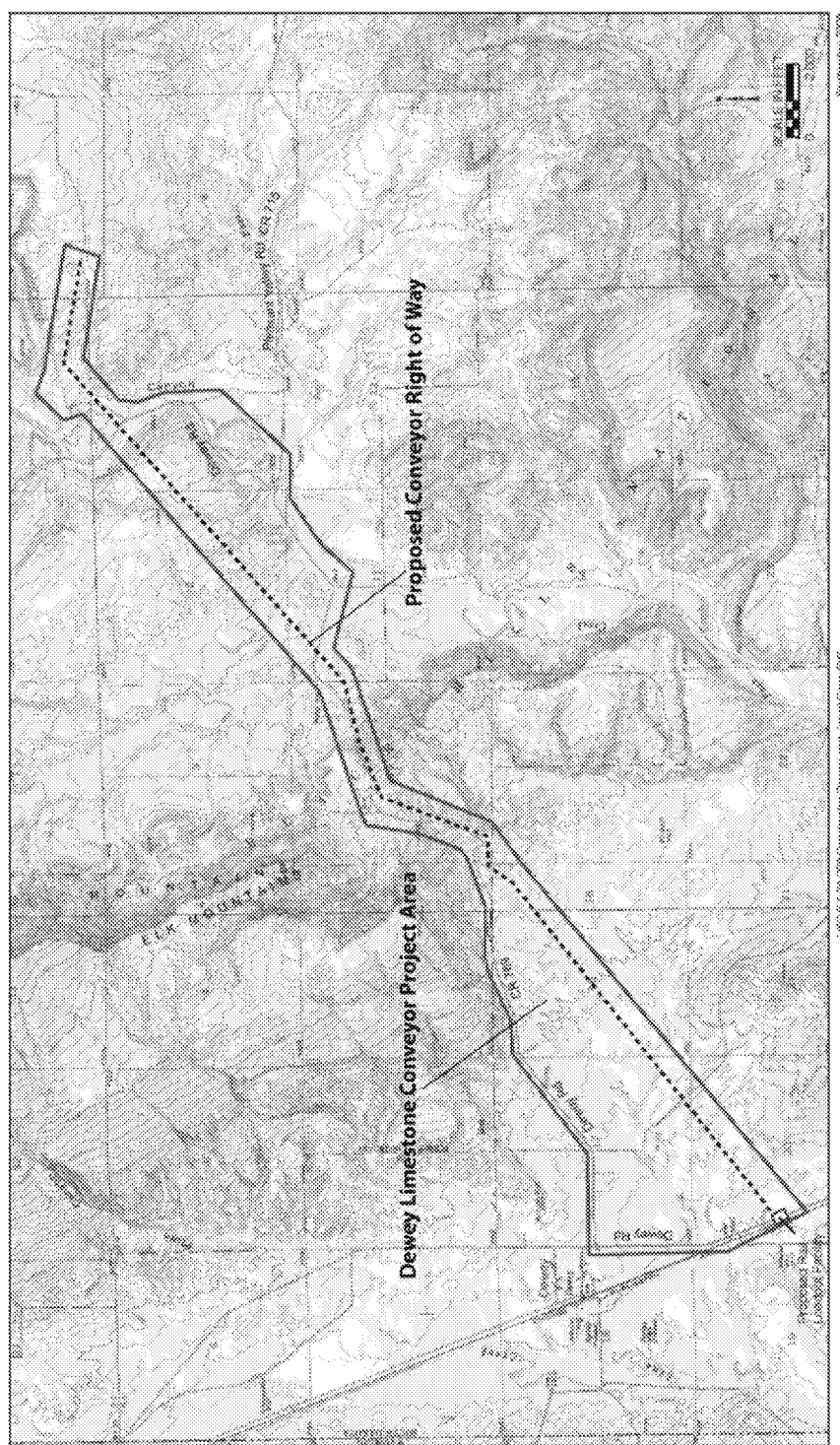


Figure 5.3-1. Map Showing Location of Dewey Road and Pass Creek in Relation to the Proposed Dewey Conveyor Project
Source: Modified From BLM (2009a)

Dewey-Burdock ISR Project will have a SMALL impact. Because regional and local roadways have sufficient capacity to accommodate traffic associated with the proposed project, the proposed Dewey-Burdock ISR Project will have a SMALL incremental impact on regional and local roadways within the transportation study area. As described in SEIS Section 4.3.1, Dewey Road would experience an increase in daily traffic of 42 percent over current levels during the

construction phase and a 24 percent increase in daily traffic during the operations phase of the proposed Dewey-Burdock ISR Project. Therefore, the proposed Dewey-Burdock ISR Project will have a SMALL incremental impact on Dewey Road within the transportation study area.

5.4 Geology and Soils

Cumulative impacts on geology and soils within Custer and Fall River Counties, South Dakota, and Weston and Niobrara Counties, Wyoming, were identified and evaluated focusing on an area within a 16-km [10-mi] radius of the proposed Dewey-Burdock ISR Project site. This area was chosen for the assessment of potential cumulative impacts on geology and soils because the uranium mineralization at other potential uranium deposits within 16 km [10 mi] of the proposed site would be located in the same geologic unit (the Inyan Kara Group). The timeframe for the analysis is 2009 to 2030 (see SEIS Section 5.1.2 for the estimated operating life of the facility).

As assessed in SEIS Section 4.4.1, all phases of the proposed Dewey-Burdock ISR Project will have a SMALL impact on geology and soils. The primary impacts on geology and soils will result from earthmoving activities. Earthmoving activities that might impact soils include the clearing of ground and topsoil and preparing surfaces for the Burdock central processing plant, Dewey satellite facility, header houses, access roads, drilling sites, and associated structures. Excavating and backfilling trenches for pipelines and cables, and preparing surfaces for potential land application of process-related liquid wastes, will also impact soils. Operations at the proposed site may produce spills of process fluids or chemical materials that may contaminate soils. Best management practices (BMPs) and required monitoring and mitigation, such as spill prevention and cleanup programs, will reduce these potential soil impacts. Subsurface impacts, such as subsidence and activation of nearby faults, will not occur at the proposed project site, because of the relatively small net withdrawal of fluids from production zone aquifers and because of the low pressures during operations relative to those needed to produce small earthquakes. As described in SEIS Section 3.5.3.2, data from aquifer pumping tests indicated a hydraulic connection between the Lakota and Fall River Formations through the intervening Fuson Shale in the Burdock area resulting from unidentified structural features or old, unplugged exploration holes. A numerical groundwater model developed by the applicant using site-specific geologic and hydrologic information suggested that leakage through the Fuson Shale is caused by improperly installed wells or improperly abandoned exploration holes completed in the Fall River and Lakota Formations (Petrotek, 2012).

Historical, present, and future natural resource development activities that relate to geology and soils in the geological and soil resources study area include stock grazing, uranium exploration/mining, and oil and gas exploration. Geologic formations hosting potential coal bed methane reserves are not present in the immediate vicinity of the proposed project. Surface-disturbing activities related to uranium, oil, and gas exploration activities, such as construction of new access roads and drill pads, will have direct effects on geological resources. During construction of these roads and drill pads, direct impacts on geology will be limited to excavation and relocation of disturbed bedrock and unconsolidated surficial materials associated with surface disturbances. Impacts from these activities include loss of soil productivity due primarily to wind erosion, changes to soil structure from soil handling, sediment delivery to surface water resources (i.e., runoff), and compaction from equipment and livestock pressure. No geological mineral resources will be lost due to grazing. BMPs and reclamation and restoration of soils disturbed by historic livestock grazing and exploration activities will mitigate loss of soil and soil productivity. However, indirect long-term effects, such as

cross-contamination of aquifers, may occur if boreholes associated with uranium, oil, and gas exploration are not properly abandoned.

Geology and soil resources have been impacted by past conventional uranium mining in the eastern part of the proposed Dewey-Burdock site, where abandoned open mine pits and mine waste overburden piles are found (see SEIS Section 5.1.1.1). Radiological conditions of soils in the areas of past conventional uranium mining are discussed in SEIS Section 3.12.1. There are underground mine workings associated with four former shallow underground uranium mines and two open pit adits (horizontal tunnels). The underground mines consist of declines (downward sloping ramps) ranging from 0 to 24 m [0 to 80 ft] below ground surface. The adits were driven into the sidewalls of the open pits. All of the underground workings were within sandstones of the Fall River Formation. At this time, there are no plans to reclaim or restore the abandoned open mine pits and mine waste overburden piles.

Development of future ISR projects in the geological and soil resources study area, such as the potential Dewey Terrace project, will have impacts on geology and soils due to increased vehicle traffic, clearing of vegetated areas, soil salvage and redistribution, discharge of ISR-produced groundwater, and construction and maintenance of project facilities and infrastructure (e.g., roads, well pads, pipelines, industrial sites, and associated ancillary facilities). The NRC staff assume that development of future ISR projects within the cumulative impacts study area will be similar to the proposed Dewey-Burdock site, with similar potential for surface impacts to geology and soils. The construction and operation of the infrastructure for these future projects, however, will be subject to the same monitoring, mitigation, and response programs required to limit potential surface impacts (e.g., erosion and contamination from spills) as at the proposed Dewey-Burdock ISR Project. With respect to compaction and surface subsidence, the groundwater will be from the same aquifers and at similar depths as those at Dewey-Burdock, with a small net withdrawal. BMPs and reclamation and restoration of disturbed areas will mitigate loss of soil and soil productivity associated with ISR activities. Salvaged and replaced soil will become viable soon after vegetation is established.

Other reasonably foreseeable future activities in the vicinity of the proposed Dewey-Burdock ISR Project site that may impact geological resources and soils include wind energy projects (see SEIS Section 5.1.1.4), and proposed transportation projects, such as the Dewey Conveyor Project and the DM&E PRB Expansion Project (see SEIS Section 5.1.1.5).

Impacts to geological resources and soils from wind energy projects, such as the potential Dewey-Burdock Wind Project, include use of geologic resources (e.g., sand and gravel), activation of geologic hazards (e.g., landslides and rockfalls), and increased soil erosion. Sand and gravel and/or quarry stone will be needed for access roads. Concrete will be needed for buildings, substations, transformer pads, wind tower foundations, and other ancillary structures. These materials will be mined as close to the potential wind energy site as possible. Tower foundations will typically extend to depths of 12 m [40 ft] or less. The diameter of tower bases is generally 5 to 6 m [15 to 20 ft], depending on the turbine size. Construction activities can destabilize slopes if they are not conducted properly. Soil erosion will result from (i) ground surface disturbance to construct and install access roads, wind tower pads, staging areas, substations, underground cables, and other onsite structures; (ii) heavy equipment traffic; and (iii) surface runoff. Any impacts to geology and soils will be largely limited to the project site. Erosion controls that comply with county, state, and federal standards will be applied. Operators will identify unstable slopes and local factors that can induce slope instability. Implementation of BMPs will limit the impacts from earthmoving activities. Foundations and

trenches will be backfilled with originally excavated material, and excess excavation material will be stockpiled for use in reclamation activities. (BLM, 2005)

The construction of the proposed Dewey Conveyor Project will have direct impacts on geological resources, although these will be limited to surface disturbances associated with excavation and relocation of disturbed bedrock and unconsolidated surficial materials along the various ROWs during construction. The surface disturbances resulting from construction of the conveyor will not result in any loss of known mineral resources. Approximately 16.2 ha [40 ac] of soils along the conveyor route will be directly impacted due to excavation and disturbance. These impacts would include loss of soil to wind and water erosion and decreased soil biological activity. Implementation of BMPs and revegetation of disturbed areas and stockpiled topsoil will minimize soil erosion. (BLM, 2009a)

The proposed DM&E PRB Expansion Project will have a significant impact on the geology and soils of western South Dakota and Wyoming. Along the route of the proposed rail line, geology and soils will be disturbed by increased traffic, clearing of vegetated areas, and soil salvage and redistribution. To limit the impacts, DM&E has proposed mitigation measures as part of the proposed PRB Expansion Project to address potential adverse impacts on geology and soils. DM&E will limit ground disturbance to only the areas necessary for project-related construction activities and will commence reclamation of disturbed areas as soon as practicable after project-related construction ends. During project-related earthmoving activities, DM&E will stockpile topsoil for application during reclamation to minimize erosion. DM&E will implement appropriate erosion control measures at stockpiles to prevent erosion. DM&E will be required to restore and revegetate soils disturbed by the project to pre-construction conditions as promptly and fully as possible. (STB, 2001)

The NRC staff determined that the cumulative impact on geology and soils within the study area resulting from all past, present, and reasonably foreseeable future actions is MODERATE. Past conventional underground and open pit surface mining has impacted geology and soils in the eastern part of the proposed Dewey-Burdock site, where abandoned open pits and mine waste overburden piles are not reclaimed or restored. Surface-disturbing activities associated with ongoing and reasonably foreseeable future uranium and oil and gas exploration and development, wind energy, and transportation projects would have direct impacts on geology and soils. Direct impacts will result from increased traffic, clearing of vegetated areas, soil salvage and redistribution, and construction of project facilities and infrastructure. Indirect impacts, such as cross-contamination of aquifers, may also occur if boreholes associated with uranium and oil and gas exploration are not properly abandoned.

The NRC staff conclude that the proposed Dewey-Burdock ISR Project will have a SMALL incremental effect on geology and soils when considered with all the other past, present, and reasonably foreseeable future actions in the study area. As described in SEIS Section 4.4.1, limited areas of the proposed project site will be disturbed by construction, and implementation of BMPs will limit soil erosion and compaction. Systems and procedures will be in place to monitor and clean up soil contamination resulting from spills and leaks. The U.S. Environmental Protection Agency (EPA) will evaluate the suitability of deep geologic formations proposed for deep well disposal of liquid wastes prior to granting a Class V UIC deep injection well permit. The EPA UIC Class V permit will impose an upper limit to the allowable injection pressure and will not allow injection at or above the fracture pressure of the injection zone formations. In potential land application areas, the applicant will be required to routinely collect and monitor soils for contamination and comply with discharge limits for treated liquid wastes applied to irrigation areas. When production and aquifer restoration are complete at the proposed project,

reclamation and decommissioning will return the site to preproduction conditions through return of topsoil, removal of contaminated soils, and reestablishment of vegetation.

5.5 Water Resources

The impact to surface and groundwater resources was evaluated within an 80-km [50-mi] radius of the proposed Dewey-Burdock ISR Project (Figure 5.1-3). The 80-km [50-mi] radius for the water resources study area encompasses the watersheds, including the Beaver Creek, Upper Cheyenne, and Angostura Reservoir watersheds, that would be potentially impacted by past, present, and reasonably foreseeable future actions (see Figure 3.5-1). The timeframe for the analysis is 2009 to 2030 (see Section 5.1.2 for the estimated operating life of the facility).

5.5.1 Surface Waters and Wetlands

The proposed Dewey-Burdock ISR Project is located in the Beaver Creek and Pass Creek watersheds (see SEIS Section 3.5.1). Beaver Creek is a perennial stream, while Pass Creek is dry for most of the year. Both creeks have ephemeral tributaries that flow after snowmelt or heavy rains. Pass Creek joins Beaver Creek southwest of the project area. Beaver Creek flows into the Cheyenne River 4.8 km [3 mi] south of this confluence, which eventually flows into the Missouri River. The U.S. Army Corps of Engineers (USACE) identified four jurisdictional wetlands within the proposed site (see SEIS Section 3.5.2). The jurisdictional sites were Beaver Creek, Pass Creek, and an ephemeral tributary to each. As described in SEIS Section 4.5.1.1, under Section 404 of the Clean Water Act the applicant must obtain a permit from USACE for any activities that may potentially impact jurisdictional wetlands. Prior to operations, the applicant must obtain construction and industrial stormwater National Pollutant Discharge Elimination System (NPDES) permits from SDDENR. The NPDES permits will include plans and programs for spill prevention and cleanup, erosion control, and stormwater runoff control, which will mitigate the impacts to surface waters and wetlands.

There are no operating ISR facilities located within 80 km [50 mi] of the proposed site, which is the cumulative impacts surface water study area. Several abandoned open pits and overburden waste piles associated with past surface mining activities are located in the Burdock portion of the site (see SEIS Figure 3.2-3). Radiation surveys reveal that soils near old surface mines have higher than background radiation levels (see SEIS Section 3.12.1). Runoff from snowmelt and heavy rains may leach and transport contaminants from the waste piles associated with these mines to surface waters and wetlands in the Beaver Creek and Pass Creek watersheds (Powertech, 2009c). Water within the Beaver Creek watershed and Pass Creek watershed flows south into the Cheyenne River. The Cheyenne River empties into the Angostura Reservoir east of the proposed Dewey-Burdock ISR Project site. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, has been used to clean up uncontrolled or abandoned legacy uranium mines in western Colorado and eastern Utah. EPA is authorized to implement Superfund. Superfund site identification, monitoring, and response activities in South Dakota would be coordinated through SDDENR.

The potential Dewey Terrace ISR project in Weston and Niobrara Counties, Wyoming, would be located 13 km [8 mi] west of the Dewey-Burdock ISR Project site. This potential future project would necessitate new roads, power lines, facilities construction, underground piping, and well drilling, all of which may have adverse impacts on surface waters and wetlands. As discussed previously for the Dewey-Burdock ISR Project, potential impacts to surface waters and wetlands

at the potential Dewey Terrace ISR project site would also be subject to mitigation through BMPs, required NPDES stormwater permits, and permits from USACE for any activities that may potentially disturb jurisdictional wetlands identified at the site.

Surface water quality within the 80-km [50-mi] area of the proposed site may be impacted by conventional oil and gas development, rangeland grazing, wind energy projects, and transportation projects. Cattle grazing is a source of nonpoint pollution to streams and wetlands in the Beaver Creek and Pass Creek drainages. SEIS Section 3.5.1.1 describes Beaver Creek as impaired for all beneficial uses because of high total dissolved and suspended solids, high salinity, presence of fecal coliform, high conductivity levels, and high water temperature. A water quality data report points to livestock as the source of fecal coliform in Beaver Creek (SDDENR, 2008). Poor management of livestock grazing may restrict flow in intermittent streams such as Pass Creek due to erosion and sedimentation resulting from decreased vegetative cover in the drainage area.

Oil wells within 80 km [50 mi] of the proposed Dewey-Burdock ISR Project site are shown in Figure 5.1-3. As discussed in SEIS Section 5.1.1.3, no producing oil and gas wells are located within the proposed Dewey-Burdock permit boundary and, at present, there is low demand for oil and gas leasing within the project boundary and in its immediate vicinity. Within 80 km [50 mi] of the proposed project site, oil wells are clustered west of the site in Weston and Niobrara Counties, southwest of Edgemont in Fall River County, and east of the site at Barker Dome in Custer County. Impacts to surface waters and wetlands from oil and gas exploration activities will be from surface runoff as new access roads and drill pads are constructed. Runoff degrades surface water quality, causes erosion, and leads to siltation of streambeds and wetlands.

Licensees must obtain construction and industrial NPDES permits from the Wyoming Department of Environmental Quality (WDEQ) in Wyoming and SDDENR in South Dakota prior to conducting oil and gas exploration and production activities. NPDES permits include plans and programs for spill prevention and cleanup, erosion control, and stormwater runoff control. These plans and programs significantly mitigate the potential impacts to surface sediment load and turbidity from exploration activities. USACE Section 404 permits are also required for any disturbances in or near jurisdictional wetlands. Section 404 permits include provisions that must be followed to mitigate impacts when conducting activities in and near jurisdictional wetlands.

Impacts to surface waters and wetlands from potential wind energy projects in the western United States, such as the Dewey-Burdock Wind Project, may include changes in water quality and alteration of natural flow systems. The quality of surface water could be degraded by soil erosion and stormwater runoff from construction activities that disturb the ground surface, and by heavy equipment traffic. Surface water flow may be diverted by access road systems or stormwater control systems. Operation of a wind energy project uses very small amounts of water and results in virtually no discharges to surface water. Operators of these facilities implement stormwater management plans to ensure compliance with applicable regulations and prevent offsite migration of contaminated stormwater or increased soil erosion. (BLM, 2005)

The proposed Dewey Conveyor Project is located principally within the Pass Creek drainage. Pass Creek and Hell Canyon merge near the southeast portion of the project area and flow southwest to the confluence of Beaver Creek (see Figure 5.3-1). The proposed conveyor project crosses several ephemeral tributaries within the Pass Creek drainage. Some sediment runoff from road and general construction activities associated with the 10.6-km [6.6-mi]-long conveyor is expected, and this could impact surface water bodies. Expected runoff

contaminants will predominantly be in the form of suspended or dissolved solids and increases in turbidity. These impacts will be partially mitigated by the fact that many area streambeds in the vicinity of the project area are dry for most of the year. Runoff potential will also be mitigated by the implementation of BMPs for runoff control. (BLM, 2009a)

The DM&E PRB Expansion Project will have a significant impact on surface water and wetlands, if completed. The new rail line will pass south of the proposed Dewey-Burdock ISR Project site (see Figure 5.1-4), through the Beaver Creek and Pass Creek watersheds. DM&E has proposed mitigation measures to address potential adverse impacts on surface waters and wetlands within the PRB Expansion Project area. Before project-related construction could begin, DM&E must obtain all federal permits, including Clean Water Act Section 404 permits and USACE permits required for project-related alteration or encroachment of wetlands, streams, and rivers. In addition, DM&E must obtain NPDES permits for regulation of stormwater discharges to surface waters. DM&E will employ BMPs, such as silt screens and straw bale dikes, to minimize soil erosion, sedimentation, runoff, and surface instability during project-related construction. These mitigation measures will minimize sedimentation into streams and wetlands. (STB, 2001)

The NRC staff have determined that the cumulative impact on surface water and wetlands within the surface water study area resulting from past, present, and reasonably foreseeable future actions is MODERATE to LARGE. Leaching and transport of contaminants from overburden waste piles associated with past conventional uranium mining in the eastern part of the proposed Dewey-Burdock site may impact surface waters and wetlands in the Beaver Creek and Pass Creek watersheds. Livestock grazing will continue to have the potential to degrade water quality in streams within the study area. Construction activities associated with other ongoing and reasonably foreseeable future actions, including uranium and oil and gas exploration and development, wind energy projects, and transportation projects, will have impacts on surface water and wetland resources. All of these actions will necessitate construction of new roads, power lines, facilities, and infrastructure, which could degrade water quality and alter natural surface water flow systems.

The NRC staff conclude that the proposed Dewey-Burdock Project will have a SMALL incremental effect on surface water and wetlands when added to all other past, present, and reasonably foreseeable future actions in the surface water study area. As described in SEIS Section 4.5.1, potential impacts to surface waters at the proposed Dewey-Burdock site will be mitigated through proper planning and design of facilities and infrastructure, the use of proper construction methods, and implementation of BMPs. Prior to initiating ISR operations at the proposed project, the applicant must also obtain a construction and industrial stormwater NPDES permit from SDDENR. The NPDES permit will include plans and programs for spill prevention and cleanup, erosion mitigation, and stormwater runoff control. In addition, to comply with Section 404 of the Clean Water Act, the applicant must obtain a permit from USACE for any activities that may potentially disturb the four jurisdictional wetlands identified within the proposed project area.

5.5.2 Groundwater

As described in SEIS Section 3.5.3.3, ISR methods will be used to extract uranium from sandstone-hosted uranium orebodies in the Fall River and Lakota aquifers at the proposed Dewey-Burdock site. The combined Fall River and Lakota aquifers are referred to as the Inyan Kara Group aquifer. Consumptive water use during construction at the Dewey-Burdock site will be generally limited to dust control, cement mixing, pump tests, delineation drilling, and

well drilling and completion. The applicant estimated that groundwater consumption during the construction phase in the Dewey and Burdock areas will be $0.8 \times 10^5 \text{ m}^3$ and $1.2 \times 10^5 \text{ m}^3$ [21.8×10^6 and 30.6×10^6 gal], respectively (Powertech, 2010). Initially, water for construction activities will be withdrawn from existing wells in the **Inyan Kara Group aquifer**. **The applicant's** estimated consumptive groundwater use during the construction phase is of the same magnitude as current withdrawals for domestic and livestock water use from the Inyan Kara Group aquifers within a 2-km [1.2-mi] radius of the proposed project (see Section 4.5.2.1.2.2). The applicant plans to install wells in the deeper Madison aquifer early in the construction phase, and once available, Madison water will become the primary water source for the construction, operation, and aquifer restoration phases (Powertech, 2010).

Assessments of environmental impacts to groundwater resources at the proposed Dewey-Burdock ISR Project are discussed in SEIS Section 4.5.2. Impacts to groundwater are **most likely to occur during the operations and aquifer restoration phases of the ISR facility's** lifecycle, but may occur during other phases. Potential groundwater impacts during the operations phase of the proposed project will be mitigated and reduced through implementation of leak detection and cleanup programs, mechanical integrity testing of wells, and adherence to EPA UIC permit requirements. During operations, the applicant commits to monitoring all domestic wells within 2 km [1.2 mi] of the wellfields and providing replacement wells to the well owners in the event of significant drawdown or degradation of water quality in these wells. **The applicant's excursion monitoring program will ensure the protection of water quality in aquifers** underlying production zone aquifers. After uranium production and aquifer restoration are completed and groundwater withdrawals are terminated at the proposed project, groundwater levels will recover with time. Groundwater restoration will also restore impacted aquifers to acceptable water quality levels. The proposed injection zones for the UIC Class V deep disposal wells are the Deadwood Formation and the Minnelusa Formation. EPA will not authorize injection into the Class V deep disposal wells unless the permittee demonstrates the well is properly sited, such that confinement zones and proper well construction minimize the potential for migration of fluids outside of the approved injection zone.

Rural population growth, oil and gas exploration development, and ISR uranium extraction are expected to contribute to the cumulative impact on groundwater resources within an 80-km [50-mi] radius of the Dewey-Burdock site. These activities create an increased demand for groundwater and have been the subject of the Black Hills Hydrology Study (USGS, 2010). **The U.S. Geological Survey (USGS) conducted this study during 1992–2002 to assess the quantity,** quality, and distribution of groundwater in the Black Hills area of South Dakota and to evaluate alternatives for management of water resources in the area. This study is used by federal, state, and local government agencies to set water development policy and protect area groundwater resources.

Groundwater in the Black Hills area of South Dakota is used for residential, municipal, industrial, and recreational purposes. Forty-five percent of the recent population growth in the Black Hills area of South Dakota has taken place in unincorporated areas without municipal water supply systems (Carter, et al., 2003). Population has grown mainly around Rapid City, but has occurred in rural areas in the southwestern Black Hills. Custer Highlands is a new housing development built approximately 16 km [10 mi] northeast of the proposed Dewey-Burdock site. Recent residential developments 19 to 24 km [12 to 15 mi] east of Dewey-Burdock include the Fundamental Church of Jesus Christ of Latter Day Saints facility (NRC, 2009c). The Southern Black Hills Water System has begun constructing a 24-km [15-mi] water transmission pipeline along Argyle Road northwest of Hot Springs, which will serve rural customers in south-central Custer County (USDA, 2012). The western extension of the pipeline will be 24 km

[15 mi] east of the Dewey-Burdock site boundary. The pipeline will transmit water pumped from a Madison aquifer well near Buffalo Gap, South Dakota, 72 km [45 mi] east of the Dewey-Burdock site (Figure 5.1-3). The proposed Dewey-Burdock ISR Project is not expected to impact the Southern Black Hills Water System project because the pipeline and Madison aquifer well are upgradient of the proposed Dewey-Burdock site.

The Madison aquifer is the most important regional aquifer supplying Rapid City, Edgemont, and numerous communities in southwestern South Dakota (see Figures 3.5-4 and 3.5-5). As described in SEIS Section 4.5.2, the applicant submitted an application for a water appropriation permit to SDDENR to pump groundwater from the Madison aquifer during ISR construction, operations, and aquifer restoration (Powertech, 2010). Edgemont is the closest community to the project site that obtains municipal water supply from the Madison aquifer. Edgemont lies 21 km [13 mi] southeast of the Dewey-Burdock site, and it is expected that any impacts on groundwater levels in the Madison aquifer at a regional level from the proposed project will be **SMALL (SEIS Section 4.5.2)**. **The applicant's excursion monitoring program described in SEIS Section 4.5.2.1.1.2 will ensure the protection of water quality in aquifers underlying the production zone.** The Madison aquifer is separated from the Deadwood Formation, one of the **proposed injection zones for the applicant's UIC Class V deep disposal wells, by the Englewood Formation** (see Figure 3.5-5). The Englewood Formation is expected to provide confinement above the proposed Deadwood Formation injection zone (Naus, et al., 2001). The Minnelusa Formation is the other proposed injection zone for the UIC Class V deep disposal wells. Confining units at the base of the Minnelusa Formation are expected to provide hydraulic separation between the Minnelusa Formation and the Madison aquifer. In some locations, these confining layers may be absent or provide ineffective confinement; this could enhance the hydraulic connection between the Minnelusa aquifer and the underlying Madison aquifer (Naus, et al., 2001). However, SDDENR concluded based on water levels in Minnelusa and Madison observation wells in the area that there is a significant difference in the potentiometric surfaces of the two aquifers, which suggests that the aquifers are hydraulically separated in the vicinity of the proposed project area (SDDENR, 2012c). Further, the UIC permit will not allow injection into the Class V deep disposal wells unless the permittee demonstrates the well are properly sited, such that confinement zones and proper well construction minimize the potential for migration of fluids outside of the approved injection zone.

The USFS-managed J.H. Keith Cascade Springs aquatic recreational area where Cascade Springs is located is approximately 40 km [25 mi] east-southeast of the proposed project site. These springs discharge groundwater from the Madison and/or Minnelusa aquifers (Driscoll, et al., 2002). As described in SEIS Section 3.5.3.1, regional groundwater flow moves outward radially from the Black Hills, which results in a northeast to southwest regional flow direction in the vicinity of the proposed project site. Because the J.H. Keith Cascade Springs recreational area is located 40 km [25 mi] from the project site and is upgradient of the proposed project site with respect to regional groundwater flow, it is expected that estimated withdrawals of water from the Madison aquifer for operations and aquifer restoration and potential disposal of liquid wastes via deep Class V injection wells into the Minnelusa will have no impact on groundwater **quantity and quality at Cascade Springs**. **The applicant's excursion monitoring program will ensure the protection of water quality in aquifers underlying production zone aquifers.**

The former Black Hills Army Depot (BHAD) is approximately 14 miles south of the Dewey-Burdock ISR Project. The BHAD was established in 1942 and remained in continuous operation until 1967. It consisted of approximately 8,537 ha (21,095 ac) and was used to store, maintain, demilitarize, and issue conventional and chemical munitions. Three areas are associated with chemical munitions and chemical agent disposal: BG-1, BG-2, and the

Chemical Plant Area (USACE, 2012). The most likely mechanism by which the Dewey-Burdock ISR Project could affect contaminant migration at the former BHAD is by changing the groundwater gradients of the Inyan Kara aquifers during pumping to redirect groundwater toward the Dewey-Burdock ISR Project. However, the Inyan Kara aquifers must first be contaminated with constituents from the former depot in order for such a change in groundwater gradients to be of any consequence. In 2012, USACE reported that chlorinated solvents and fuel residues were discovered in shallow groundwater samples from the BHAD; however, no groundwater contamination was discovered in the BG-1 and BG-2 areas (USACE, 2012).

According to USACE, the Fall River aquifer is approximately 335 m (1,100 ft) deep at the former BHAD and is overlain by thick sequences of shales (USACE, 1992). Any surface contamination would be unlikely to penetrate such a thick shale sequence and contaminate the Fall River. Furthermore, the Fall River aquifer is artesian in this area (USACE, 1992). Therefore, if the overlying shales were perforated, water would move upward toward the ground surface, essentially preventing contamination from migrating downward into the aquifer. Considering the isolated nature of the Inyan Kara aquifers and the lack of significant groundwater contamination at the site, the NRC staff conclude that proposed operations at the Dewey-Burdock ISR Project will have no impact on site conditions at the former BHAD.

Within an 80-km [50-mi] radius of the proposed project, ongoing and planned ISR facilities, oil and gas exploration, wind energy projects, and transportation projects activities may contribute to impacts on groundwater resources.

The applicant has identified a potential ISR project at Dewey Terrace in Wyoming (Powertech, 2009b). The Dewey Terrace project would be located about 13 km [8 mi] west of the Dewey-Burdock ISR Project area in Weston and Niobrara Counties, Wyoming (Figure 5.1-3). If future ISR operations occurred at Dewey Terrace, there would be uranium extraction from the same aquifer (i.e., the Inyan Kara aquifer) as the proposed Dewey-Burdock ISR Project. The combined ISR projects may impact groundwater levels in the ore zone aquifer and impact the water quality of the ore zone aquifer at the two sites. Licensees of ISR facilities are required to implement excursion detection, control, mitigation, and remediation plans under NRC regulations to reduce the potential impact on groundwater quality and quantity. Impacts on groundwater resulting from the interaction of ISR activities and oil and gas exploration and production are not likely because these activities are conducted in stratigraphically separated aquifers. ISR activities at the Dewey-Burdock ISR Project will take place in sandstone aquifers of the Fall River and Lakota aquifers at depths of 61 to 244 m [200 to 800 ft] (see SEIS Section 3.4.1.2). Oil and gas producing wells in Fall River and Custer Counties are located in the Minnelusa Formation at depths ranging from 415 to 1,081 m [1,363 to 3,547 ft] (see SEIS Section 5.1.1.3). In Wyoming, the producing wells closest to the project are in Niobrara County and are located in the Leo Sandstone of the Minnelusa Formation at depths ranging from approximately 785 to 823 m [2,575 to 2,700 ft] (see SEIS Section 5.1.1.3). The NRC-required excursion monitoring programs at ISR facilities will ensure that water quality in aquifers underlying production zone aquifers, including the Madison, Minnelusa, and Deadwood aquifers, would be protected.

Deep well injection of process-related water is a disposal method ISR and oil production facilities use. For deep well disposal in South Dakota, the applicant must obtain UIC permits for the targeted deep aquifer from the EPA. The applicant has proposed injecting process-related effluents from the Dewey-Burdock Project into the Deadwood and Minnelusa Formations, below the Morrison Formation (see Figure 3.5-5), using Class V (nonhazardous) wells (Powertech, 2010). EPA will evaluate the suitability of the proposed deep injection wells and would only

grant a permit if the deep disposal practice is safe for public health and safety and will not impact potential underground sources of drinking water. To ensure water quality, the liquid waste injected via Class V wells into deep aquifers must not be classified as hazardous under the Resource Conservation and Recovery Act and must be treated to meet NRC release standards in 10 CFR Part 20, Subparts D and K and Appendix B.

Impacts to groundwater from potential wind energy projects in the western United States, such as the Dewey-Burdock Wind Project, will not be significant. During construction, water is required for mixing of concrete and for dust control along access roads and other areas of disturbance around the turbines, but these uses will be temporary. Development and construction of wind energy projects will use BMPs to mitigate impacts to both groundwater and surface water. Once a wind energy project is operating, minimal quantities of water are needed. (BLM, 2005)

Groundwater for the Dewey Conveyor Project will likely be used to suppress dust during road building and use activities, and for the construction of concrete foundation supports for the conveyor along its 10.6-km [6.6-mi] course. In addition, groundwater will be used for dust control/mitigation once the proposed quarry and conveyor are operational. This water demand will be supplied by one or more production wells (one at the quarry site and one at the rail load-out facility). The source for the supply well at the rail load-out facility will likely be developed in the Inyan Kara Group aquifer. This supply well will likely be used solely for dust suppression at the rail load-out area, and therefore the groundwater demand will be quite low, around 94.6 L/min [25 gpm] or less. (BLM, 2009a)

The proposed DM&E PRB Expansion Project (see SEIS Section 5.1.1.5) will have an impact on groundwater. Groundwater will be used to suppress dust during rail and bridge construction activities. Once operational, the PRB Expansion Project will use negligible amounts of groundwater. Water demand during construction activities will be supplied by existing municipal and private wells. DM&E will ensure that any wells that may be affected by project-related construction or reconstruction activities are appropriately protected or capped to prevent well and groundwater contamination. If wells are located on private land, DM&E will secure permission from the landowner before undertaking any actions. (STB, 2001)

The NRC staff have determined that the cumulative impact on groundwater resources within the water resources study area resulting from past, present, and reasonably foreseeable future actions is MODERATE. This finding is based on ongoing and reasonably foreseeable future actions that will (i) increase demand on the regional Madison aquifer, which is used for residential, municipal, and recreational purposes in the study area; (ii) impact groundwater quantity and quality in the Inyan Kara Group aquifer, which hosts uranium deposits surrounding the proposed Dewey-Burdock site; and (iii) potentially impact water quality in deep geologic formations that are used for deep disposal of liquid wastes. In addition, ongoing and reasonably foreseeable future actions will use groundwater for construction of concrete foundations and supports and for dust suppression during construction and operations activities, which will potentially impact water quantity in regional and local aquifers in the study area.

The NRC staff conclude that the proposed Dewey-Burdock ISR Project will have a SMALL incremental effect on groundwater resources when added to all other past, present, and reasonably foreseeable future actions in the groundwater study area. Based on the foregoing analysis, the potential impact of the proposed project on the existing and future use and quality of water for local and surrounding residential, municipal, and recreational purposes will be minimal. Impacts on groundwater resulting from interaction between ISR activities at the

proposed Dewey-Burdock site and oil and gas production are unlikely because the ISR production zone aquifers are separated from underlying oil and gas bearing formations by hundreds to thousands of meters [hundreds to thousands of feet]. EPA permitting requirements will protect groundwater in aquifers used for deep well injection of process-related liquid effluents from the proposed action. The liquid waste injected via Class V wells into deep aquifers will have to be treated to meet NRC release standards in 10 CFR Part 20, Subparts D and K, and Appendix B. After uranium production and aquifer restoration are completed and groundwater withdrawals are terminated at the proposed Dewey-Burdock ISR Project, groundwater levels will recover with time. Groundwater restoration will restore impacted aquifers at the proposed project to acceptable water quality levels. Therefore, the NRC staff conclude that the potential impact on groundwater resources from operating the proposed Dewey-Burdock ISR Project will be SMALL (SEIS Section 4.5.2).

5.6 Ecological Resources

The cumulative impact to ecological resources was evaluated for the area within an 80-km [50-mi] radius surrounding the proposed Dewey-Burdock ISR Project. The proposed project is located within the Great Plains physiographic province on the edge of the Black Hills uplift. The area under consideration includes the Sagebrush Steppe, Black Hills Foothills, Black Hills Plateau, and Black Hills core highland ecoregions. The timeframe for the analysis of cumulative impacts is 2009 to 2030 (see SEIS Section 5.1.2 for the estimated operating life of the proposed Dewey-Burdock project). Older data are considered where applicable to demonstrate historical trends.

5.6.1 Terrestrial Ecology

Activities occurring in the area of the proposed Dewey-Burdock ISR Project boundary include grazing and herd management, hunting, and uranium, oil, and gas exploration. There may be cumulative impacts to ecological resources, including both flora and fauna. These impacts include a reduction in wildlife habitat and forage productivity; modification of existing vegetative communities; and the potential spread of invasive species and noxious weed populations. Concerning wildlife, impacts may involve loss, alteration, or incremental fragmentation of habitat; displacement of and stresses on wildlife; modification of prey and predator communities; and direct or indirect mortalities. Land disturbance resulting from reasonably foreseeable future actions (e.g., potential wind farm and transportation projects discussed in Sections 5.1.1.4 and 5.1.1.5) in the ecological resources cumulative impacts study area will have small ecological impacts, individually, if mitigative measures are employed (BLM, 2005, 2009a; STB, 2001). However, assuming that adjacent habitats for each disturbed parcel of land will be at, or near, carrying capacity, and considering there will be an unavoidable reduction or alteration of the habitats, development activities in the Black Hills Foothills and Sagebrush Steppe ecoregions could cumulatively reduce wildlife and plant populations and alter population structure. For some species that may require specific conditions for their habitats, future use will be strongly influenced by the quality and composition of the remaining habitats. Additionally, grasses and noxious weeds tend to replace sagebrush after disturbances.

Loss and degradation of native sagebrush shrubland habitats has imperiled much of this ecosystem type as well as sagebrush-obligate species, including the Greater sage-grouse (*Centrocercus urophasianus*). Sage-grouse are found in the sagebrush shrubland habitats, and sagebrush is essential during all seasons and for every phase of their lifecycle (USGS, 2009). Most of the sagebrush lands in the region have been changed by land use, such as livestock

grazing, agriculture, or resource extraction. These uses can influence habitats either directly or indirectly, and they can alter the disturbance regime by changing the frequency of fire (USGS, 2009). The long-term viability of the sage-grouse rangewide continues to be at risk because of population declines related to habitat loss and degradation. Sage-grouse populations have declined overall from 1965 to 2007 with the greatest decline occurring before the mid-1980s. The total rangewide population decline is estimated at 45 to 80 percent from historic levels (Becker, et al., 2009). Populations have been declining at 2.0 percent per year from 1956 to 2003 (Connelly, et al., 2011). Because of its spatial extent, oil and gas resource development is regarded as playing a major role in the decline of the sage-grouse species in the eastern portion of the species' range (Becker, et al., 2009). **Future oil and gas development is projected to cause a 7 to 19 percent decline in sage-grouse lek population counts throughout much of the current and historic range of the sage-grouse (Connelly, et al., 2011).** As of this writing, the U.S. Fish and Wildlife Service (FWS) has designated the Greater sage-grouse a "candidate species" under the Endangered Species Act (ESA). FWS will consider the bird on an annual basis for listing as a threatened or endangered species. The State of Wyoming is critical for sage-grouse as it currently contains 64 percent of all known sage-grouse habitat and more active leks than any other state (Doherty, et al., 2011).

According to the South Dakota Game, Fish, and Parks (SDGFP), there are no crucial big game habitats or migration corridors in the ecological resources study. However, the area does provide habitat for a variety of big game, including deer, antelope, turkeys, elk, and bighorn sheep. Destruction or alteration of portions of this habitat in conjunction with human disturbance associated with ongoing and reasonably foreseeable future actions could result in SMALL incremental impacts to herd animals.

As discussed in SEIS Section 4.6.1, the proposed Dewey-Burdock Project has the potential to impact vegetation, small- to medium-sized mammals, reptiles, and a number of avian species. These species include raptors, waterfowl, shorebirds, upland game birds, and nongame birds known to occur as seasonal, migratory, or year-round residents. Impacts may occur to species during all phases of the proposed project and are expected to be SMALL to MODERATE. Potential SMALL to MODERATE impacts to avian species (e.g., habitat loss, fragmentation, noise disturbance) will also be likely to occur at other present and reasonably foreseeable future actions (e.g., oil and gas facilities, wind energy projects, and transportation projects; see SEIS Section 5.1.1) throughout the cumulative impacts study area and potentially impact other localized populations. Wind energy projects, such as the potential Dewey-Burdock Wind Project, have the potential to increase avian mortality resulting from bird and bat collisions, particularly in bird migration routes. BLM reported that the number of bird and bat collisions at wind energy projects is generally relatively small, when compared with collisions from other human-made structures (BLM, 2005).

The NRC staff have determined that the cumulative impact on terrestrial ecology within the ecological resources study area resulting from all past, present, and reasonably foreseeable future actions is MODERATE. This finding is based on habitat disturbance resulting from actions including (i) uranium and oil and gas exploration and development, (ii) potential ISR projects such as the Dewey Terrace ISR Project in Niobrara and Weston Counties in Wyoming, (iii) potential wind energy projects such as the Dewey-Burdock Wind Project, and (iv) potential transportation projects such as the Dewey Conveyor Project and the DM&E PRB Expansion Project. Habitat disturbance associated with these actions will impact vegetation by promoting the spread of noxious weeds and fragmenting vegetative communities. Impacts to wildlife could include loss, alteration, or incremental fragmentation of habitat; displacement of and stresses on wildlife; and direct and indirect mortalities.

The NRC staff concludes that the proposed Dewey-Burdock Project will have a SMALL incremental effect on terrestrial ecology when considered with all other past, present, and reasonably foreseeable actions in the ecological resources study area. The proposed action will disturb a maximum of 566 ha [1,398 ac] of habitat with most of the habitat disturbance consisting of scattered, confined drill sites for wells and potential land irrigation areas. These disturbances will not dramatically transform large expanses of habitat from their original character; therefore, no substantial long-term impact will generally be expected. Furthermore, the applicant will control and monitor potential land application areas to ensure observed impacts to soils and vegetation that could adversely affect flora and fauna are addressed. For vegetative species with specialized habitat requirements, future population viability will be strongly influenced by the quality and composition of the remaining habitat. Because the area of disturbed land will be a small percentage of the ecological resources study area, and because of stated mitigative measures the applicant has committed to as described in SEIS Section 4.6.1, impacts on vegetation from the proposed Dewey-Burdock project will have only a SMALL incremental impact when considered with all past, present, and reasonably foreseeable future actions. Although sage-grouse have been present in Fall River County in the past, and although a potential habitat for sage-grouse exists, Greater sage-grouse are not reported within 6.4 km [4 mi] of the proposed project boundary (SEIS Sections 3.6.3 and 4.6.1.1.2). Because NRC staff expect that similar habitat is present in the project area that FWS evaluated for the nearby Buffalo Gap National Grassland (see SEIS Sections 3.6.3 and 4.6.1.1.2) (Hodorff, 2005), it is unlikely that optimum canopy coverage of sagebrush habitat is present to support breeding and wintering populations within the proposed project area.

5.6.2 Aquatic Ecology

As described in SEIS Sections 4.6.1.1, 4.6.1.2 and 4.6.1.3, because of the limited and ephemeral nature of surface water at the proposed Dewey-Burdock Project, the occurrence of aquatic species is also limited. No loss of aquatic habitat will result from planned construction activities or land application sites at the proposed Dewey-Burdock Project (Powertech, 2009a). In addition, no surface water will be diverted, no process water will be discharged into an aquatic habitat, and stormwater runoff will be managed through the NPDES permit (as discussed in SEIS Section 4.5.1.1.2). Therefore, during all phases of the proposed Dewey Burdock Project lifecycle, the potential impacts to aquatic species and habitats will be SMALL.

The NRC staff determined that the cumulative impact on aquatic ecology resulting from all past, present, and reasonably foreseeable future actions is SMALL. Cumulative impacts from oil and gas exploration and development, other ISR activities, wind energy projects, and transportation projects described in SEIS Section 5.1.1 will not affect the aquatic ecosystem across the ecological resources study area. This conclusion is based on the limited and ephemeral nature of surface water in and surrounding the study area. The Beaver Creek and Pass Creek systems are the main surface water drainages in the study area. As discussed previously, Beaver Creek does not support sensitive aquatic species and is impaired due to high dissolved and suspended solids, high salinity, and fecal coliform (SDDENR, 2008). Pass Creek, on the other hand, does not provide a year-round source of water sufficient to maintain a population of aquatic species. In addition, all proposed activities in the study area will employ BMPs and comply with federal and state water quality regulations, which will reduce impacts on aquatic ecology.

The NRC staff have concluded that the proposed Dewey-Burdock Project will have a SMALL incremental effect on aquatic ecology when considered with all other past, present, and

reasonably foreseeable actions in the study area. This conclusion is based on the limited and ephemeral nature of Beaver Creek and Pass Creek and other surface water features on the proposed Dewey-Burdock ISR Project site, and on the existing impaired status of Beaver Creek.

5.6.3 Protected Species

As discussed in SEIS Sections 4.6.1.1.1.4 and 4.6.1.2.1, no federally listed species are present within the proposed Dewey-Burdock Project license area. Potentially suitable habitat for migrating whooping cranes exists where standing water is present, which will occur primarily along Beaver Creek and Pass Creek and their drainages, and old mine pits. Direct impacts from the proposed project are unlikely because whooping cranes are not known to breed in South Dakota; however, cumulative impacts from oil and gas exploration and development, other ISR activities, wind energy projects, and transportation projects described in SEIS Section 5.1.1 could distress migrating cranes.

Rangewide, the long-term viability of the sage-grouse continues to be at risk because of population declines related to habitat loss and degradation. Because of its spatial extent, oil and gas resource development is regarded as playing a major role in the decline of the **sage-grouse species in the eastern portion of species' range (Becker, et al., 2009)**. Future oil and gas development is projected to cause a 7 to 19 percent decline in sage-grouse lek population counts throughout much of the current and historic range of the sage-grouse (Connelly, et al., 2011).

Not including federally listed species, the NRC staff determined that the cumulative impact on protected species within the ecological resources study area resulting from all past, present, and reasonably foreseeable future actions is MODERATE. Cumulative impacts to federally listed species would be SMALL. This finding is based on habitat disturbance to potential non-federal protected species resulting from actions described in SEIS Section 5.1.1 including (i) uranium and oil and gas exploration and development, (ii) potential ISR projects such as the Dewey Terrace ISR expansion project in Niobrara and Weston Counties in Wyoming, (iii) potential wind energy projects such as the Dewey-Burdock Wind Project, and (iv) potential transportation projects such as the Dewey Conveyor Project and the DM&E PRB Expansion Project. Impacts to protected and threatened species from these actions could include loss, alteration, or incremental fragmentation of habitat; displacement of and stresses on species; and direct and indirect mortalities.

The NRC staff have concluded that the proposed Dewey-Burdock Project will have a SMALL incremental effect on protected species when considered with all other past, present, and reasonably foreseeable actions in the study area. No federally listed protected species are present within the proposed Dewey-Burdock Project license area, and the proposed license area does not contain critical habitat for any protected species. Furthermore, habitat disturbance at the proposed project site will consist primarily of scattered, confined drill sites for wells and potential land irrigation areas that will not result in large expanses of habitat being dramatically transformed, lost, or degraded.

5.7 Air Quality

Cumulative impacts to air quality were assessed primarily for the portions of the Black Hills-Rapid City Intrastate Air Quality Control Region located within an 80-km [50-mi] radius of the proposed Dewey-Burdock ISR Project. This area, hereafter called the air quality region of influence, covers the majority of Custer and Fall River Counties, the eastern portion

of Pennington County (excluding Rapid City), and a very small portion of southwestern Lawrence County (see Figure 5.1.3).

5.7.1 Non-Greenhouse Gas Emissions

As described in Section 5.1.1, past, present, and foreseeable activities that may contribute to pollutant emissions include uranium exploration and extraction, oil and gas exploration and production, coal mining and coal bed methane operations, wind energy projects, the proposed Dewey Conveyor Project, and the proposed DM&E PRB Expansion Project. Air pollutants emitted by these sources potentially have a cumulative impact within the region and include, but are not limited to, carbon monoxide (CO) and nitrogen oxides (NO_x) from internal combustion engines used at natural gas pipeline compressor stations; CO, NO_x, particulates, sulfur dioxide (SO₂), and volatile organic compounds (VOCs) from gasoline and diesel vehicle tailpipe emissions; dust generated by vehicle traffic on unpaved roads and agricultural activities; NO₂ and particulate emissions from railroad locomotives; and air pollutants transported from emission sources located outside the region. The contribution of past and present activities will be addressed first. Then the analyses will examine the foreseeable activities.

The past and present contributions of projects in the region that emit air pollutants are represented in the ambient air quality monitoring results described in SEIS Section 3.7.2. These monitoring results indicate the air quality is in attainment for all National Ambient Air Quality Standards (NAAQS). Table 3.7-3 contains data primarily from Wind Cave National Park, the nearest ambient air quality monitoring station, and a Prevention of Significant Deterioration Class I site. This monitoring station was established in 2005 to determine air pollution background levels and whether the site was impacted by the long-range transport of air pollutants, such as pollution from the increase in oil and gas development in Colorado, Wyoming, and Montana (SDDENR, 2009). According to the South Dakota Ambient Air Monitoring Annual Network Plan (SDDENR, 2009), the annual PM₁₀ concentrations at the Wind Cave site are the lowest in the state and the annual PM_{2.5} concentrations are some of the lowest in the state. The nitrogen dioxide (NO₂) and SO₂ annual concentrations are very low and are at **the monitoring equipment's detection limit (i.e., the ability of the equipment to detect the presence of a compound)**. The 8-hour average ozone levels at the Wind Cave station are **similar to those at the state's other monitoring sites** and are below NAAQS. Since 2007, trends at the Wind Cave site, as well as some of the other monitoring sites, show decreasing ozone concentration levels. Ongoing ambient air monitoring, such as that conducted at Wind Cave National Park, provides an avenue to continually assess air quality from the cumulative emissions observed at a particular location. The air permitting process provides a mechanism for regulatory authorities such as SDDENR to protect air quality through permit conditions and restrictions. The permitting process, including the Prevention of Significant Deterioration, is described in SEIS Sections 2.1.1.1.6.1.1 and 3.7.2.

Regional air modeling and other studies in the region of influence often focus on Wind Cave National Park, the Class I area located in Custer County about 46.7 km [29 mi] from the proposed site. As a Class I area, these analyses examine impacts to visibility. Visibility impairment occurs when the pollution in the air either scatters or absorbs the light. Both natural and man-made sources contribute air pollution which impairs visibility. Natural sources include windblown dust and smoke from fires. Man-made sources include electric utilities (i.e., power plants), industrial fuel burning, and motor vehicles.

The South Dakota Department of Environment and Natural Resources Regional Haze State Implementation Plan (SDDENR, 2011) provided pollution emission inventories and modeling results and also identified the sources of the pollutants that affect the visibility. The plan provided information based on 2002 actual emissions and 2018 projections. This plan identified sulfate, organic carbon, and nitrate as the major contributors to visibility impairment at Wind Cave National Park. The modeling indicates that only about 3 percent of the sulfur dioxide pollution affecting visibility at Wind Cave National Park comes from sources within South Dakota and at most, about 10 percent of the nitrogen dioxide pollution comes from sources within South Dakota. The state that contributes the most sulfur dioxide and nitrogen dioxide pollution that affects visibility at this Class I area is Wyoming. The state that contributes the most organic carbon is South Dakota, with the predominant source coming from natural fires. The state that contributes the coarsest particulate matter is South Dakota, accounting for up to 45 percent of the total. However, between 60 and 71 percent of this coarse particulate matter is attributed to natural sources.

BLM also evaluated potential long-range air impacts to the Wind Cave National Park from activities in Wyoming, specifically the Powder River Basin west of the proposed Dewey-Burdock ISR Project. Emission sources for these activities included coal-related facilities (i.e., mines, power plants, railroads, conversion facilities), permitted sources in Wyoming and Montana, coal bed methane production sources, and miscellaneous (i.e., roads, urban areas, conventional oil and gas, noncoal power plants). Emissions were developed for base year 2004 (NO₂, SO₂, PM_{2.5}, and PM₁₀) and were projected for year 2020. For the Wind Cave site, year 2020 projected impacts were well below NAAQS standards. All modeled NO_x and SO₂ levels were near or less than 1 percent of the NAAQS, and the highest PM level was about 12 percent of the NAAQS (BLM, 2009b). Visibility impacts were identified for the Wind Cave site. When comparing the year 2004 baseline case to the projected year 2020 impacts, the number of days with greater than a 10 percent change in visibility increases by 31 days per year. (BLM, 2009b)

The analyses will now consider the various reasonably foreseeable future actions starting with the proposed DM&E PRB Expansion Project. This project would impact air quality in eastern Wyoming and southwestern South Dakota. Mitigation measures have been recommended as part of the proposed DM&E PRB Expansion Project to address potential adverse impacts to air quality. DM&E would be required to meet EPA emission standards for diesel-electric locomotives (40 CFR Part 92). To the extent practicable, DM&E would adopt fuel-saving practices, such as throttle modulation, dynamic braking, increased use of coasting trains, and shutting down locomotives when not in use for more than an hour, to reduce overall emissions during project-related operations. To minimize fugitive dust emissions during project-related construction activities, DM&E would implement fugitive dust suppression controls, such as spraying water, tarp covers for haul vehicles, and installation of wind barriers. (STB, 2001)

The only ISR site listed in Table 5.1-1 that occurs within the entire Black Hills-Rapid City Intrastate Air Quality Control Region is the proposed Dewey-Burdock ISR Project. The Edgemont site associated with conventional uranium milling is within the air quality region of influence and currently serves as a UMTRCA Title II disposal site under DOE ownership. As described in SEIS Sections 5.1.1.2 and 5.1.1.3, coal mining and oil and gas well development activities within the air quality region of influence are minimal.

None of the wind energy projects listed in Table 5.1-3 are within the air quality region of influence. The nearest existing wind power project is located about 161 km [100 mi] west-southwest in Converse County, Wyoming. As described in SEIS Section 5.1.1.4, a landowner group has organized to explore the possibility of a wind farm on privately owned land

within and surrounding the proposed Dewey-Burdock ISR Project (see Figure 5.1-4). For wind energy projects, such as the potential Dewey-Burdock Wind Project, the construction phase would generate more air emissions than the operation phase (BLM, 2005). Multiple concurrent construction projects could contribute to regional pollutant emissions loads from construction and worker vehicle exhaust emissions. Localized incidences of fugitive dust along unpaved roads could occur if multiple construction projects occurred simultaneously. However, programmatic BMPs would include mitigation measures to reduce airborne dust at project sites. The dust emission contribution to cumulative impacts to regional air quality would be minimal, because they would be localized and temporary. Air emissions from vehicles involved in operational activities at wind energy projects would be minimal because of the small number of employees needed onsite at any one time (see SEIS Section 5.3). The small number of employees and associated trips during project operations would not have a noticeable effect on cumulative regional air quality (BLM, 2005).

The proposed Dewey Conveyor Project has the potential to cumulatively impact air quality in the vicinity of the proposed project. The aboveground conveyor system would be fully enclosed, preventing material and most dust from escaping into the atmosphere. Fugitive dust would be monitored during construction and during the initial stages of operation using particulate dust collectors (PM₁₀ and PM₂₅ samplers). **The State of South Dakota's Air Quality permit requires** this monitoring for various facilities associated with the conveyor project. The rail load-out facility located approximately 1.6 km [1 mi] from the northwestern boundary of the proposed project site would require an air quality permit from SDDENR, which would include requirements for minimizing dust generation by using air pollution control equipment and other applicable operational BMPs (BLM, 2009a).

The NRC staff determined that the cumulative impact on air quality within the study area resulting from other past, present, and reasonably foreseeable future actions is MODERATE. The current ambient air pollution concentrations relate to the air quality impacts from past and present actions. As described in SEIS Section 3.7.2, the area is classified as in attainment for each of the NAAQS pollutants. However, the Regional Haze State Implementation Plan and BLM regional analyses discussed in this SEIS section indicate that Wind Cave National Park does experience visibility impacts.

Cumulative impacts on air quality include the incremental effects from the proposed Dewey-Burdock ISR Project when added to the aggregate effects of other past, present, and reasonably foreseeable future actions. The NRC staff conclude in SEIS Section 4.7.1 that the proposed Dewey-Burdock ISR Project will have a SMALL to MODERATE effect on air quality. As stated in the preceding paragraph, NRC staff find that the impact on air quality within the study area resulting from other past, present, and reasonably foreseeable future actions is MODERATE. When combining the Dewey-Burdock impacts with all other impacts from other past, present, and reasonably foreseeable future actions in the study area, NRC staff conclude that the overall cumulative impact would be MODERATE. Comparing the total pollutant concentration (i.e., the modeling results for the project emissions when added to the background concentration levels) to the NAAQS is useful in making a cumulative impacts assessment. For the final AERMOD modeling run, the peak year total concentration for all of the pollutants are below the NAAQS. Due to short-term PM₁₀ fugitive emissions, which are primarily generated from travel on unpaved roads, the proposed project impacts are considered MODERATE at times. However, the modeling shows that this impact is limited to the immediate vicinity where the fugitive emissions are generated. For the visibility analysis, the peak year project-specific results were below the contribution threshold, which indicates whether a source can be reasonably anticipated to cause or contribute to visibility impairment. For the acid

deposition analysis, combining the peak year project-specific modeling results with the measured values at Wind Cave National Park, and comparing these to the critical load, provides another type of cumulative impacts assessment. All of the combined acid deposition results are below the critical load.

For information purposes, NRC staff has also presented the impact analyses using the PM₁₀ modeling results that do not implement the AERMOD dry depletion option (i.e., the initial modeling run) and the staff has included the PM₁₀ emissions in the CALPUFF visibility analysis. The NRC staff conclude in SEIS Section 4.7.1 that for analysis under these modeling assumptions and without additional considerations, the proposed Dewey-Burdock ISR Project will have a LARGE effect on air quality. As stated previously, NRC staff determined that the impact on air quality within the study area resulting from other past, present, and reasonably foreseeable future actions is MODERATE. When combining the Dewey-Burdock impacts with all other impacts from other past, present, and reasonably foreseeable future actions in the study area, NRC staff conclude that the overall cumulative impact will be LARGE.

5.7.2 Global Climate Change and Greenhouse Gas Emissions

NRC staff determined that a meaningful approach to address the cumulative impacts of greenhouse gas emissions, including carbon dioxide, is to recognize that (i) such emissions contribute to climate change, (ii) climate change is best characterized as the result of numerous and varied sources, each of which might seem to make a relatively small addition to global atmospheric greenhouse gas (GHG) concentrations, (iii) carbon footprint is a relevant factor in evaluating potential impacts of an alternative, and (iv) analysis may include both the proposed **action's contribution to atmospheric GHG levels and the potential effects of climate change to the proposed action**. These concepts are more fully developed in Sutley (2010).

GHG emissions are described in SEIS Sections 2.1.1.1.6.1.1, 3.7.2, and 4.7. As described in SEIS Section 4.7.1.1.2, the operation phase emissions bound the other phases in terms of carbon dioxide levels generated. However, the peak year carbon dioxide annual emission estimate (when all four phases occur simultaneously) of 38,621 metric tons [42,572 short tons] represents the highest amount of emissions the proposed action will generate in any one project year (see Table 2.1-6). Electrical consumption is the source that generates the most emissions followed by mobile sources and then the stationary sources. The mobile sources include equipment associated with the drilling activity with the primary contributor being the drill rig (IML, 2013). As described throughout SEIS Section 4.7.1.2, NRC staff do not expect to see any appreciable difference in the overall greenhouse gas emission levels between the land disposal option and the deep well disposal option.

As described in SEIS Section 3.7.2, South Dakota accounted for approximately 36.5 million metric tons [40.2 short tons] of gross carbon dioxide equivalent (CO₂e) emissions in 2005 and forecast levels of 39.1 and 46.6 million metric tons [43.1 and 51.4 short tons] in 2010 and 2020, respectively (Center for Climate Strategies, 2007). The 2005 total is reduced to 34.9 million metric tons [38.5 short tons] as a result of annual sequestration (removal) due to forestry and other land uses (Center for Climate Strategies, 2007). The proposed Dewey-Burdock ISR Project peak year emission estimate of 38,621 metric tons [42,572 short tons] equates to less than 1 percent (0.11 percent) of the overall GHG emissions for South Dakota in 2005. The low level of GHG emissions from the proposed Dewey-Burdock Project relative to the state estimates provides the basis for the NRC staff conclusion that the proposed Dewey-Burdock ISR Project would have a SMALL incremental impact on air quality in terms of GHG emissions

when added to the MODERATE cumulative impacts anticipated from other GHG emissions from past, present, and reasonably foreseeable future actions.

NRC also examined the potential effect of climate change on the proposed Dewey-Burdock ISR Project. While there is general agreement in the scientific community that some climate change is occurring, considerable uncertainty remains in the magnitude and direction of some of the changes, especially predicting trends in a specific geographic location. As described in SEIS Section 3.7.2, the recent report from the U.S. Global Change Research Program (GCRP) served as a source for climate change information (GCRP, 2009). From 1993 to 2008, the average temperature in the Great Plains increased by approximately 0.83 °C [1.5 °F] compared to the 1961 to 1979 baseline. South Dakota and the proposed Dewey-Burdock site are considered part of the Great Plains in this study. From 2010 to 2029, the average temperature in the Great Plains is projected to increase approximately 1.7 °C [3 °F] relative to the 1961 to 1979 baseline. Although GCRP did not incrementally forecast a change in precipitation by decade, it did project a change in spring precipitation from the baseline period (1961 to 1979) to the next century (2080 to 2099). For the region of South Dakota where the proposed Dewey-Burdock ISR Project would be located, GCRP forecasted a 10 to 15 percent increase in spring precipitation (GCRP, 2009).

Based on the previous analyses, the overall effect of projected climate change on the proposed Dewey-Burdock ISR Project is SMALL. The predicted increases in temperature and precipitation over the project lifespan are small. Much of the activity associated with ISR milling occurs below ground, whereas the listed climate change parameters are associated with the surficial and atmospheric environments. The predicted increase in precipitation and subsequent infiltration into the groundwater could result in an increase in recharge to the aquifer in the future. This could affect the proposed project by increasing the volume of groundwater in the orebody and improving the effectiveness of the aquifer restoration process. Similarly, potential changes to the site environment and resources, such as ecology during the period when the proposed activities would be conducted, would not be sufficient to alter the environmental conditions at the proposed site in a manner that would change the magnitude of the environmental impacts from what has already been evaluated in this SEIS.

5.8 Noise

Cumulative impacts from noise were assessed within an 8-km [5-mi] radius of the proposed Dewey-Burdock ISR Project. This area served as the cumulative assessment geographic boundary and was chosen because noise dissipates quickly from the source. GEIS Section 4.4.7 stated that sound levels as high as 132 dBA will taper to the lower limit of human hearing (20 dBA) at a distance of 6 km [3.7 mi] in this region, so a larger 8-km [5-mi] study area will be appropriate to evaluate potential cumulative impacts on noise (NRC, 2009a). The timeframe for the analysis is 2009 to 2030 (see SEIS Section 5.1.2 for the estimated operating life of the facility).

Noise associated with the proposed Dewey-Burdock ISR Project includes the operation of equipment such as trucks, bulldozers, and compressors; traffic due to commuting workers or material/waste shipments; and wellfield, central processing plant, and satellite facility activities and equipment. Other noises would include traffic noise from nearby roads and railroads. As detailed in SEIS Section 4.8.1, noise impacts to onsite and offsite residential and wildlife receptors and onsite workers from ISR activities at the proposed project would be SMALL for all stages of the project lifecycle.

Present and reasonably foreseeable future noise-generating activities in the vicinity of the proposed Dewey-Burdock ISR Project would primarily be from operating heavy equipment and traffic noise associated with (i) uranium and oil and gas exploration and development, (ii) wind energy projects, and (iii) transportation projects.

Oil and gas operations generate noise during construction, well drilling, and operation of compressor stations. However, noise levels from these activities are reduced to ambient levels at distances of approximately 488 m [1,600 ft] (BLM, 2003). Noise-related impacts are generally limited to the 610 m [2,000 ft] immediately surrounding each discrete source (e.g., drill rig, compressor station). Within the cumulative impacts from noise study area, there are four producing oil wells at the Barker Dome oilfield 6 km [4 mi] east of the proposed Dewey-Burdock site and another four producing oil wells at the Plum Canyon oilfield 5 km [3 mi] northwest of the proposed Dewey-Burdock site (see Figure 5.1-4). As described in SEIS Section 5.1.1.1, demand for oil and gas leasing in the vicinity surrounding the proposed Dewey-Burdock ISR project area is low and the level of oil and gas exploration and development is not anticipated to increase significantly in the foreseeable future.

At this time, no future ISR projects have been identified within the cumulative noise impacts study area (i.e., within a 8-km [5-mi] radius of the proposed Dewey-Burdock site). The applicant has identified a potential ISR project at Dewey Terrace located 13 km [8 mi] west of the Dewey-Burdock site (see SEIS Section 5.1.1.1). If developed, Dewey Road may be used to access the potential Dewey Terrace project from Edgemont, which is the nearest community to the south. Therefore, the potential Dewey Terrace project may contribute to noise within the study area from additional traffic on Dewey Road from commuting workers, construction and operations deliveries, and yellowcake and byproduct transport.

Construction of a wind energy project, such as the potential Dewey-Burdock Wind Project, will produce noise from activities including access road construction, grading, drilling and blasting (for tower foundations), construction of ancillary structures, cleanup, and revegetation. In general, construction activities will last for a short period (e.g., 1 to 2 years) and will occur during the day; accordingly, their potential impacts will be temporary and intermittent in nature. Noise generated by turbines, substations, transmission lines, and maintenance activities during the operational phase of a wind energy project will approach typical background levels for rural areas at distances of 610 m [2,000 ft] or less. Like construction activities, decommissioning activities will occur during the day and would last for a short period compared with wind turbine operation, and therefore the potential impacts will be temporary and intermittent in nature. (BLM, 2005)

Noise sources associated with the proposed Dewey Conveyor Project include the conveyor, conveyor drive motors, locomotives, and diesel-powered loaders. Noise levels from the proposed Dewey Conveyor Project are predicted to be below the EPA guideline of 55 dBA within 21 m [70 ft] from the conveyor drive motors and below the estimated existing 40 dBA within 111 m [365 ft] from the conveyor drive motors. Noise levels due to the rail load-out are predicted to meet the EPA guidelines of 55 dBA within 320 m [1,050 ft] from equipment and meet the existing ambient 40 dBA within 1,288 m [4,225 ft] from equipment. Mitigation measures the conveyor operator, GCC Dacotah, proposes to reduce noise impacts include installing high-grade mufflers on diesel-powered equipment, combining noisy operations to occur for short durations, and limiting rail loading to daytime hours. (BLM, 2009a)

The proposed DM&E PRB Expansion Project will have a significant impact on noise in western South Dakota and Wyoming. Noise will be produced by heavy equipment use and vehicular

traffic during construction and by locomotive engine and wheel/rail noise during rail line operations. DM&E has proposed mitigation measures as part of the proposed expansion project to address potential adverse impacts on noise. DM&E will maintain project-related construction and maintenance vehicles in good working condition with properly functioning mufflers to control noise. DM&E will comply with Federal Railroad Administration regulations (49 CFR Part 210) for decibel limits for train operations. DM&E will mitigate train wayside noise (locomotive engine and wheel/rail noise) for noise-sensitive receptors along project-related new rail line construction to within 70 dBA. To minimize noise, DM&E will properly maintain rails and regularly service locomotives, keeping mufflers in good working order to control noise. (STB, 2001)

The NRC staff have determined that the cumulative impact on noise within the noise study area resulting from all past, present, and reasonably foreseeable future actions is MODERATE. Operation of reasonably foreseeable future actions, such as the Dewey Conveyor Project and DM&E PRB Expansion Project, would have significant noise impacts within the cumulative impacts study area. Noise associated with operation of the conveyor project will include the conveyor, conveyor drive motors, locomotives, and diesel-powered loaders. Locomotive engine and wheel/rail noise will have long-term noise impacts during operation of the DM&E rail line project. In addition, the potential Dewey Terrace ISR project may contribute to noise along Dewey Road from commuting workers, equipment and materials deliveries, and yellowcake and byproduct transport. Other ongoing and reasonably foreseeable future actions are not expected to have a significant impact on noise within the cumulative impacts study area. There are only eight producing oil wells within the study area, and demand for oil and gas leasing is low. Coal bed methane reserves are not present within the study area. Potential wind energy projects, such as the Dewey-Burdock Wind Project, are generally compatible with the primary land uses in the study area, including livestock grazing, recreation, and wildlife habitat conservation (BLM, 2005). During operation of a wind energy project, noise generated by turbines, substations, transmission lines, and maintenance activities will approach typical background levels for rural areas at distances of 610 m [2,000 ft] or less (BLM, 2005).

The NRC staff have concluded that the proposed Dewey-Burdock Project would have a SMALL incremental effect on noise when considered with all other past, present, and reasonably foreseeable actions in the noise study area. There are few sensitive noise receptors (e.g., residences, communities) in the cumulative impacts noise study area. As described in SEIS Section 4.8.1, noise generated by construction and operational activities at the proposed Dewey-Burdock ISR Project will dissipate or be reduced by mitigation measures before reaching onsite and offsite residential and sensitive wildlife receptors. Additionally, noise levels will be mitigated by administrative and engineering controls to maintain noise levels in work areas below Occupational Safety and Health Administration (OSHA) regulatory limits.

5.9 Historic and Cultural Resources

Cumulative impacts on historic and cultural resources were assessed within a 16-km [10-mi] radius of the proposed Dewey-Burdock ISR Project. This area delineates the geographic boundary utilized for the cumulative analysis of historic and cultural resources and will be collectively referred to as the “historic and cultural resources study area.” The assessment of cumulative impacts on historic and cultural resources beyond 16 km [10 mi] was not undertaken because at this distance the impacts on historic and cultural resources from the proposed Dewey-Burdock ISR Project on other past, present, and reasonably foreseeable future actions will be minimal. The timeframe for the analysis is 2009 to 2030 (see SEIS Section 5.1.2 for the

estimated operating life of the facility). In 2009, the applicant submitted a license application to NRC; year 2030 represents the license termination at the end of the decommissioning period. Potential impacts to cultural and historic resources could result from energy development, erosion, and grazing activities. These impacts would result primarily from the loss or damage to historical, cultural, and archaeological resources, but also from temporary restrictions on access to these resources. Applicants for ISR facilities would conduct appropriate historic and cultural resource surveys as part of prelicense application activities. Impacts to cultural resources are often minimized for projects located on federal or tribal lands or that are part of a federal action, because such projects are subject to the National Historic Preservation Act (NHPA), the Section 106 consultation process, and other applicable statutes.

Cultural resources may be affected indirectly by the consequences of nearby projects, such as erosion, destabilization of land surfaces, increased area access, and increased vibration from locomotive and heavy truck traffic. As discussed in SEIS Section 4.9, the impact of the proposed ISR project on historic and cultural resources in the Dewey-Burdock project area has been categorized as SMALL to LARGE, depending on the phase of the facility lifecycle.

The analysis of cumulative impacts on historic and cultural resources at the proposed project focused on identification and the assessment and implementation of mitigative measures to protect resources within the area of potential effect (APE). As described in SEIS Section 3.9, the APE is defined as the area that may be directly or indirectly impacted by construction, operations, aquifer restoration, and decommissioning activities associated with the proposed action. As described in SEIS Section 4.9.1, archaeological field investigations identified 18 historic sites within the proposed project area that are listed in the National Register of Historic Places (NRHP) or are eligible for listing in the NRHP. As further described in SEIS Section 4.9.1, tribal cultural surveys recommended 17 known archaeological sites and 12 newly discovered cultural sites as eligible for listing in the NRHP. Mitigation measures that will be implemented to protect NRHP-eligible sites are described in SEIS Section 4.9.1.

The applicant stated that site avoidance is the goal during development and production of the proposed project (Powertech, 2009a, Section 3.8.1). Sites in areas of activity where ground disturbance is planned will be fenced to avoid accidental disturbance. Furthermore, personnel will be made aware of the presence of sites prior to the start of ground-disturbing activities (Powertech, 2009a). If it is determined that NRHP-eligible sites described in SEIS Section 4.9.1 cannot be avoided, then treatment plans will require that the applicant complete mitigation prior to construction. Treatment plans will be established following the development of an agreement between the applicant, NRC, South Dakota State Historic Preservation Office (SD SHPO), interested federal and state agencies (e.g., BLM and EPA), and interested Native American tribes. As described in SEIS Section 4.9.1, if historical or cultural resources are encountered during ISR activities, the applicant is required by license condition to stop work (NRC, 2013; License Condition 9.8). The discovered artifacts will be inventoried and evaluated in accordance with 36 CFR Part 800. Work will not restart without authorization from the NRC, SD SHPO, and BLM to proceed.

The rock art sites in Craven Canyon are the most significant cultural resource that has been identified in the vicinity of the proposed Dewey-Burdock ISR Project. Craven Canyon is located approximately 10 km [6 mi] east of the proposed Dewey-Burdock ISR Project boundary (see Figure 5.1-4). The rock art in Craven Canyon consists of both petroglyphs, the oldest form of rock art, and pictographs. Recently, there have been increased prohibitions on the extraction of uranium and other minerals in the Craven Canyon area, which is designed to protect cultural resources such as rock art.

Past, present, and reasonably foreseeable future actions that have the potential for cumulative effects on historic and cultural resources identified in the cumulative impacts study area include uranium exploration and extraction, oil and gas exploration, wind energy projects (e.g., the Dewey-Burdock Wind Project), and transportation projects (e.g., the proposed Dewey Conveyor Project and the proposed DM&E PRB Expansion Project) (see SEIS Sections 5.1.1.1 through 5.1.1.5).

Uranium extraction, and oil and gas exploration and drilling have occurred in the cumulative impacts study area, and additional drilling is likely to occur in the future. In the case of oil and gas exploration, areas have been proposed for lease sales, but neither applications nor permits to drill have been filed to date (see SEIS Section 5.1.1.3). Activities associated with exploration drilling will include access road and drill pad construction. All access roads and drill sites proposed for any type of exploration drilling will need to be surveyed for historic and cultural resources. Surveys by professional archaeologists and cultural specialists to identify and evaluate NRHP eligibility prior to project construction activities will need to be conducted. In addition, identification of properties of importance to Native American tribes will also need to be undertaken as part of consultation. If NRHP-eligible sites are found, appropriate levels of evaluation and mitigation will be required prior to construction.

One project that may have a cumulative impact on historic and cultural resources in the vicinity of the proposed Dewey-Burdock ISR Project is the potential Dewey Terrace ISR project. As with the current proposed project, the potential Dewey Terrace ISR project will be surveyed for historic and cultural resources prior to licensing and, if NRHP-eligible sites are identified, appropriate levels of evaluation and mitigation will be required.

Surface-disturbing activities from wind energy developments, such as the potential Dewey-Burdock Wind Project, could uncover and destroy cultural resources. However, the development and implementation of programmatic agreements and BMPs will limit the potential impacts at a wind energy project site. For example, a cultural resources management plan will be developed to determine the mitigation activities needed for cultural resources found at a site. Avoidance of the historic and cultural resources will be the preferred mitigation option. Other mitigation options will include archaeological surveys and excavation (as warranted), monitoring, and inadvertent discovery procedures. The programmatic agreements and BMPs will also require consultation under NHPA Section 106, including consultation with SD SHPO and Native American tribes. The implementation of agreements and BMPs would greatly limit impacts from wind energy projects on cultural resources, which are expected to be mainly archaeological sites. However, impacts to cultural resources with a visual component (i.e., sacred landscapes) may occur. (BLM, 2005)

As described in SEIS Section 5.1.1.5, the proposed GCC Dacotah Inc. Dewey Conveyor Project would use an elevated, enclosed conveyor to transport limestone quarried from the Minnekahta Limestone to a rail load out facility near Dewey, South Dakota (see Figure 5.3-1). GCC Dacotah Inc. controls minerals rights to areas of potential limestone exploitation north of the proposed conveyor, where the Minnekahta Limestone lies at or near the ground surface (BLM, 2009a). These mineral rights are controlled either by ownership or leasing of private lands, or have been acquired by the staking of claims on lands underlain by federally held mineral rights. To date, the location of quarrying operations has not been finalized. However, federal mineral lands acquired by GCC Dacotah Inc. for potential limestone mining have been previously surveyed for cultural resources and over 60 sites were identified (Buechler, 1999; Sundstrom, 1999; Winham, et al., 2001). It is expected that many sites would be impacted during quarrying

activities. Therefore, appropriate measures would be required to ensure that identified cultural resource sites are avoided and protected during quarrying operations (BLM, 2009a).

NRHP-eligible historic or cultural resource sites have not been identified along the proposed Dewey Conveyor Project route or within a 30-m [100-ft]-wide buffer zone on either side of the proposed construction zone (see Figure 5.3-1). However, the implementation of alternatives for the proposed Dewey Conveyor Project will result in direct impacts to NRHP-eligible properties. To address these impacts, the following mitigation measures have been proposed: (i) GCC Dacotah Inc. will make a reasonable effort to design the project in a manner to avoid NRHP-eligible properties; (ii) unless authorized by BLM, USFS, and SD SHPO, no surface disturbance will occur within 30 m [100 ft] of the boundary of identified NRHP-eligible properties; and (iii) unless authorized by BLM, USFS, and SD SHPO, no surface disturbance will occur within 30 m [100 ft] of the boundary of 14 unevaluated sites and until their NRHP eligibility has been determined. GCC Dacotah Inc. has also indicated that measures will be taken to ensure that even those sites that are not NRHP-eligible will be avoided and protected, wherever possible. (BLM, 2009a)

The proposed DM&E PRB Expansion Project will have a significant impact on cultural and historical resources. The project area has a long history of human occupation. Known sites of archaeological and historical significance occur throughout the area. The Department of Transportation Section of Environmental Analysis (SEA) identified 408 cultural resources sites within 0.6 km [1.0 mi] of Alternative C for the proposed DM&E project (see Figure 5.1-5). Of these, 96 sites were in South Dakota and 312 were in Wyoming. Within 0.6 km [1.0 mi] of an alternate route (Alternative B) for the proposed project, SEA identified 298 cultural resources sites, 70 in South Dakota and 228 in Wyoming. SEA determined that the project will have significant impacts to these resources because of the likelihood that construction of the proposed project will encounter significant cultural resources. To address potential adverse impacts on cultural resources, DM&E has proposed mitigation measures, including (i) informing workers of applicable federal, state, and local requirements for the protection of archaeological resources, graves, and other cultural resources and training them on how to recognize and treat resources; (ii) complying with a programmatic agreement and identification plan developed through the NHPA Section 106 consultation process; and (iii) implementing mitigation measures documented in a memorandum of agreement (MOA) developed to ensure that the concerns of Native Americans are considered and addressed. (STB, 2001)

Because the cumulative impacts study area has a long history of human occupation, it is expected that historic properties of religious and cultural importance to Native American tribes occur throughout the area and that many will be affected by the ongoing and reasonably foreseeable future actions discussed previously. Certain historic properties may be eligible for inclusion in the NRHP because of their association with cultural practices or beliefs of a living community that are rooted in its history and are important in maintaining its continuing cultural identity (National Register Bulletin 38). Historic properties that might be present within the cumulative impacts study area include camp and burial sites, plant collection areas, and sacred and worship sites.

The NRC staff have determined that the cumulative impact on cultural and historic resources within the cultural and historic resources study area resulting from all past, present, and reasonably foreseeable future actions is MODERATE to LARGE. Archaeological and historic sites and artifacts are present in the area of the proposed site, and any present and future projects could potentially cause adverse impacts to these sites and artifacts.

The NRC staff conclude that the proposed Dewey-Burdock ISR Project will have a SMALL to LARGE incremental impact on historic and cultural resources when added to the MODERATE to LARGE cumulative impact to these resources expected from other past, present, and reasonably foreseeable future actions. As discussed previously, archaeological field investigations identified 18 historic sites listed on or recommended as eligible for listing in the NRHP within the proposed Dewey-Burdock project area. In addition, tribal cultural surveys recommended 17 known archaeological sites and 12 newly discovered cultural sites as eligible for listing in the NRHP. ISR activities, especially ground-disturbing activities during the construction phase at the proposed project, may result in a cumulative loss of historic and cultural resources. The mitigation of adverse impacts at the proposed project will be addressed in an agreement between the applicant, NRC, SD SHPO, interested federal and state agencies (e.g., BLM, SDDENR), and interested Native American tribes.

5.10 Visual and Scenic Resources

Cumulative impacts to visual and scenic resources were assessed within a 3.2-km [2-mi] radius of the proposed Dewey-Burdock ISR Project. Beyond this distance, any changes to the landscape would be in the background distance zone for the purposes of visual resource management (VRM) defined by BLM, and would be either unobtrusive or imperceptible to viewers (BLM, 1984, 1986). The timeframe for the analysis is 2009 to 2030 (see SEIS Section 5.1.2 for the estimated operating life of the facility).

As described in SEIS Section 2.1.1.1, the proposed Dewey-Burdock site encompasses 4,282 ha [10,580 ac] of mostly private land in northern Fall River and southern Custer Counties, South Dakota. BLM has not assigned a VRM class to the region that encompasses the proposed project area. However, similar areas adjacent to the proposed project in Wyoming are identified as VRM Classes III and IV (BLM, 2000). At present, human-made features within and in the immediate vicinity of the proposed site include roads, power lines, ranch residences, fence lines, and abandoned open pits and overburden piles associated with past conventional uranium mining. The primary visual feature superimposed on the proposed project landscape is the transportation and utility corridor consisting of Dewey Road, the BNSF railroad, and overhead power lines. The abandoned open pits and overburden piles from historical mining that are located within the eastern and northeastern parts of the proposed project site contribute adversely to the scenic and visual quality of the area. However, the abandoned open pits and overburden piles are not visible from surrounding county roads and highways.

As described in SEIS Section 4.10.1, potential impacts on visual and scenic resources from the proposed Dewey-Burdock ISR Project will be the contrast of surface facilities and infrastructure (e.g., drilling rigs, powerlines, process buildings, header houses, wellheads, irrigation center pivots) with the existing visual inventory. These types of visual impacts are consistent with the management objectives of the VRM Class III and IV areas that include similar areas adjacent to the proposed project in Wyoming (BLM, 2000). As described in detail in SEIS Section 4.10.1, the impacts to visual and scenic resources from the surface structures and equipment will be SMALL for all phases of the proposed Dewey-Burdock ISR Project. NRC staff base this conclusion on the remote location of the project site and mitigation measures that will be used to reduce potential visual and scenic impacts (e.g., selecting building materials and paint that blend with the natural environment, dust suppression).

Past, present, and reasonably foreseeable future activities that could have cumulative impacts on the visual and scenic resources in the vicinity of the proposed Dewey-Burdock Project

include uranium exploration/extraction, potential oil and gas exploration and development, wind energy projects, and potential transportation projects (i.e., the proposed Dewey Conveyor Project and the proposed DM&E PRB Expansion Project).

Surface disturbances and fugitive dust emissions associated with access roads and drill pad construction developed for uranium and oil and gas exploration should have only a minor cumulative impact on the visual and scenic resources in the area. Access road segments will be considerably shorter than Dewey Road. Truck and equipment traffic for both construction and drilling activities will be relatively minor, consisting of one or two pieces of equipment per day for construction and two to four pick-up truck trips per day to support drilling activities. All surface disturbances and equipment associated with exploration drilling will be temporary, and the affected ground surface will be fully reclaimed after use. Demand for oil and gas leases is low, and there are no producing oil wells within the 3.2-km [2-mi] radius that could potentially contribute to cumulative impacts related to visual and scenic resources (see SEIS Section 5.1.1.3). Furthermore, there are no reasonably foreseeable future ISR operations in the 3.2-km [2-mi] radius that could potentially impact visual and scenic resources (see SEIS Section 5.1.1.1).

Wind energy projects, such as the potential Dewey-Burdock Wind Project (see Figure 5.1-4), will have an impact on visual and scenic resources within the cumulative impacts study area. The heights, type, and color of turbines, together with their placement with respect to local topography (i.e., on a ridge or mesa), are factors that will contribute to visual intrusion on the landscape. Also, the need for additional transmission lines to connect wind energy projects to the regional power grid could contribute to cumulative impacts. On U.S. government-owned lands, flexibility in locating turbines and transmission line towers to avoid visual impacts to important view sheds will be considered through consultation with the wind energy developer and the managing federal agency (e.g., BLM, USFS) on a project-specific basis. (BLM, 2005)

The proposed 10.6-km [6.6-mi]-long Dewey Conveyor Project will have an impact on visual and scenic resources within the cumulative impacts study area (see Figure 5.1-4). The proposed conveyor will consist of elevated 1.5 m by 2.4 m by 12.2 m [5 ft by 8 ft by 40 ft] conveyor segments attached to supporting concrete piers or foundations spaced 7.6 to 12.2 m [25 to 40 ft] apart. The average conveyor height will be 4.9 m [16 ft] with approximately 2.7 m [9 ft] of clearance beneath the conveyor segments. The conveyor alignment is proposed to begin at Dewey Road approximately 1.8 km [1.1 mi] south of the town of Dewey and approximately 1.6 km [1 mi] north-northwest of the proposed Dewey-Burdock Project boundary. The alignment will head east-northeast, progressively away from the proposed Dewey-Burdock Project area. (BLM, 2009a)

The DM&E PRB Expansion Project will impact visual and scenic resources in the cumulative impacts study area by the visual intrusion of the railroad on the landscape (see Figure 5.1-4). Construction and operation will affect the current scenic character of the cumulative impacts study area as well as the remoteness and feeling of vastness this undeveloped area provides. Some visual mitigation will be accomplished by the use of nonreflective rails and color matching of facilities where possible. For example, DM&E will comply with USFS color coordination requirements for facilities associated with the railroad. Any facility more than 41 cm [16 in] tall will be required to be olive drab, flat tan, or desert brown except where they are required by law to be a specific color. (STB, 2001)

The NRC staff have determined that the cumulative impact on visual and scenic resources in the study area resulting from all past, present, and reasonably foreseeable future actions is MODERATE to LARGE. This finding is based on the structures and infrastructure from potential

future actions that could significantly alter the viewshed within 3.2 km [2 mi] of the proposed Dewey-Burdock ISR Project including (i) turbines and transmission lines associated with future wind energy projects (e.g., the Dewey-Burdock Wind Project), (ii) the elevated conveyor and supporting concrete piers associated with the Dewey Conveyor Project, and (iii) rails and facilities associated with the DM&E PRB Expansion Project.

The NRC staff have concluded that the proposed Dewey-Burdock ISR Project will have a SMALL incremental impact on visual and scenic resources when considered with all the other past, present, and reasonably foreseeable future actions in the study area. As described in SEIS Section 4.10.1, visual and scenic impacts from the equipment used to construct buildings and drill wells will be temporary and visual impacts from structures and fugitive dust will be mitigated by the rolling topography and BMPs (e.g., color consideration for structures and dust suppression).

5.11 Socioeconomics

As described in SEIS Section 5.1.2, the timeframe for this cumulative impacts analysis for socioeconomics resources begins in 2009 and ends in 2030. The following socioeconomic indicators were evaluated as part of this analysis.

- Population
- Employment
- Housing
- School enrollment
- Public services
- Fiscal revenue

The geographic boundary varies for the socioeconomic resource indicators listed and is described as part of the analyses for each subcategory. The potential socioeconomic impacts for the proposed Dewey-Burdock ISR Project will be SMALL. These impacts are described in SEIS Section 4.11.

5.11.1 Population

The geographic boundary for the cumulative population analysis includes Custer and Fall River Counties in South Dakota and Niobrara and Weston Counties in Wyoming. Population change over time is generally an excellent indicator of cumulative social and economic change in a given area. South Dakota's population has grown from 696,004 in 1990 to 814,180 in 2010 and is estimated to decline modestly to 801,939 in 2020 (Brooks, 2008; USCB, 2012). Population in Custer County grew from 6,179 in 1990 to 8,216 in 2010 and is projected to decline slightly to 8,186 in 2020 (Brooks, 2008; USCB, 2012). In Fall River County, population decreased slightly from 7,353 in 1990 to 7,094 in 2010 and is projected to increase to 7,423 in 2020 (Brooks, 2008; USCB, 2012). Wyoming population has grown from 453,588 in 1990 to 563,626 in 2010 and is projected to increase to 622,360 in 2020 and 668,830 in 2030 (WDAI, 2011, 2012). Niobrara County population has declined slightly from 2,499 in 1990 to 2,484 in 2010 and is projected to increase to 2,660 in 2020 and 2,710 in 2030 (WDAI, 2011, 2012). Weston County population has grown from 6,518 in 1990 to 7,208 in 2010 and is estimated to increase to 7,900 in 2020 and 8,120 in 2030 (WDAI, 2011, 2012).

The relatively flat county population projections do not take into account the current economic conditions, climate change legislation (including cap and trade components), and future technological changes (e.g., wind energy and clean coal innovations). If the reasonably foreseeable future actions described in SEIS Section 5.1.1 go forward and become functional within the boundary of the cumulative population analysis study area, workers will be required to build and operate these facilities. These future actions include potential wind energy projects, such as the Dewey-Burdock Wind Project, and proposed transportation projects, which include the Dewey Conveyor Project and the DM&E PRB Expansion Project. Additional workers will also be required to staff any expansion in uranium extraction projects, such as the development of the potential Dewey-Terrace project in Weston and Niobrara Counties. It is likely that any additional workers will desire to live closer to their place of employment and become active in their community. The towns of Custer (population 2,067), Hot Springs (population 3,711), Edgemont (population 774), and Newcastle (population 3,532) may see population increases associated with future actions in the population analysis study area. Assuming that energy development and transportation projects are developed and constructed, the addition of new workers in these towns will have a MODERATE cumulative impact on population. The relatively small pool of workers associated with the proposed Dewey-Burdock ISR Project (86 short-term positions during construction, 84 positions during operations, 9 positions during aquifer restoration, and 9 positions during decommissioning) will have only a SMALL incremental impact on population. If a disproportionate number of workers associated with the proposed Dewey-Burdock project elect to reside in small towns like Edgemont, the incremental impact on population could be MODERATE.

5.11.2 Employment

The geographic boundary for the cumulative employment analysis includes Custer and Fall River Counties in South Dakota and Niobrara and Weston Counties in Wyoming. While no individual county employment projections are available, the State of South Dakota is expected to experience modest growth through 2020, with an average annual growth rate of 0.9 percent (SDDL, 2012). Employment in mining is expected to increase annually by 4 jobs or 0.5 percent through 2020, while employment in heavy construction is expected to increase annually by 50 jobs or 1.5 percent through 2020. The State of Wyoming is expected to experience modest growth through 2021, with an average annual growth rate of 1.5 percent (WDWS, 2012). Employment in mining (including oil and gas extraction) is expected to increase annually by 846 jobs or 3.2 percent through 2021.

The cumulative employment analysis study area may experience an increased rate of employment from ongoing and reasonably foreseeable future actions that may occur (see SEIS Section 5.1.1). If the potential Dewey-Burdock Wind Project and the proposed Dewey Conveyor Project and DM&E PRB Expansion Project are financed and developed, workers will be required to build and operate these projects. Wind energy projects are expected to employ 100 to 150 workers during a 1 to 2 year construction period and 10 to 20 workers to operate and maintain the project (BLM, 2005). The proposed Dewey Conveyor project is expected to employ 50 workers during the 1 year construction period and about 12 workers afterwards to operate the project (BLM, 2009a). The proposed DM&E project will employ more than 900 workers over the 2 to 3 year construction phase (STB, 2001). However, only a small portion of the overall construction workforce will be located in a single location at any one time. Once a particular phase of DM&E project is complete, workers will relocate to other job locations (STB, 2001). Workers will also be required to staff potential ISR facilities in the study area, such as the potential Dewey-Terrace project. It is assumed that potential ISR facilities in the study area will employ the same number of workers as the proposed Dewey-Burdock ISR

Project (86 during construction, 84 during operations, 9 during aquifer restoration, and 9 during decommissioning). This projected growth related to future actions will result in SMALL to MODERATE cumulative impacts to employment in the form of additional job opportunities. Based on the number workers expected at the proposed action, the proposed Dewey-Burdock ISR Project will have a SMALL incremental impact on employment.

5.11.3 Housing

The geographic boundary for the cumulative housing analysis includes Custer and Fall River Counties in South Dakota and Niobrara and Weston Counties in Wyoming. With the projected growth from ongoing and reasonably foreseeable future actions, new employees moving into the study area will require housing. Smaller communities, such as Edgemont, are likely to experience MODERATE cumulative impacts due to limited housing availability. Assuming, however, that new employees relocate to one of the larger communities, such as Custer, Hot Springs, or Newcastle, there should be adequate housing opportunities to absorb the influx of facility workers. Therefore, the cumulative impact will be SMALL. Given the number of Dewey-Burdock ISR facility employees (86 during construction, 84 during operations, 9 during aquifer restoration, and 9 during decommissioning), there will be SMALL incremental impacts to housing markets, prices, and real estate development in larger communities such as Custer, Hot Springs, and Newcastle. However, housing impacts may be MODERATE if a disproportionate number of employees at the proposed Dewey-Burdock ISR project elect to reside in smaller communities, such as Edgemont.

5.11.4 Education

The Custer School District, Hot Springs School District, Edgemont School District, Weston County School District No. 1, and Weston County School District No. 7 represent the geographic boundary for the school enrollment resource analysis. These school districts were selected because most permanent Dewey-Burdock ISR Project employees will be likely to live in one of these districts. Most of the construction workforce, however, is not expected to relocate entire families during the relatively brief construction phase (1 to 2 years). Student enrollment in these school districts totaled 2,915 in 2010 and ranged from 150 students in the Edgemont School District to 882 students in the Custer School District (see Table 3.11-5).

Most of the construction workforce for the ongoing and reasonably foreseeable future actions described in SEIS Section 5.1.1 is not expected to relocate entire families into the school enrollment study area. The construction phases of future actions, such as wind projects, ISR facilities, and transportation projects, are relatively brief, ranging from 1 to 3 years. During operations of ongoing and reasonably foreseeable future actions, new employees will be more likely to move their families and send their children to schools in the study area. The potential increase in school-aged children will likely be split between the school districts in the school enrollment study area. Based on the number of permanent employees needed to operate reasonably foreseeable future actions (e.g., 84 for ISR facilities, 10 to 20 for wind projects, and about 12 for transportation projects), cumulative impacts to school enrollment are expected to be SMALL. Based on the number of workers (84) needed for the proposed Dewey-Burdock ISR Project, the proposed action will have a SMALL incremental impact on school resources in the larger school districts within the school enrollment study area, such as the Custer and Hot Springs school districts. However, school enrollment impacts may be MODERATE if a

disproportionate number of employees at the proposed Dewey-Burdock ISR Project elect to reside in smaller communities, such as Edgemont.

5.11.5 Public Services

The geographic boundary for the public services socioeconomic resource cumulative impact analysis includes Custer and Fall River Counties in South Dakota and Niobrara and Weston Counties in Wyoming. There may be incremental impacts to local government facilities and public services as population increases in affected counties and communities, which generally result in across-the-board increases in the demand on services. Even small changes in population size may result in additional demand for health and human services, such as doctors, hospitals, police, and fire response. Additionally, the various reasonably foreseeable future actions described in SEIS Section 5.1.1 may result in increased demand for specific services (e.g., road maintenance). Operational impacts to public services and public infrastructure, as a result of the workers relocating with their families, will be area-specific, and may be long term. As described in SEIS Section 3.11.7, there are a number of existing medical and emergency facilities that will be capable of handling issues related to increased population. Additionally, the State of South Dakota Social Services has offices located throughout the state, including in Custer and Hot Springs. The State of Wyoming has numerous social services offices located throughout the state as well. There is an office for Niobrara and Weston Counties, as well as other local offices located in Newcastle. It is not anticipated that additional population from ongoing and reasonably foreseeable future actions will stress the current social services capabilities in the public services resource study area. Therefore, cumulative impacts to public services are expected to be SMALL. Given the number of workers required for the proposed Dewey-Burdock ISR Project (86 during construction, 84 during operations, 9 during aquifer restoration, and 9 during decommissioning), incremental impacts from the proposed action will have a SMALL impact on public services.

5.11.6 Local Finance

The geographic boundary for the local finance socioeconomic resource is Fall River and Custer Counties. Tax revenue will accrue mainly in Fall River and Custer Counties and to the State of South Dakota, and because of the structure of the taxing system, taxes may not accrue or be distributed to the localities proportionate to the population/public service impacts experienced by those entities. The tax system in place helps capture tax revenue during construction, operation, and decommissioning of industrial facilities. Additionally, a county ad valorem tax from current and future mineral extraction operations will contribute to local government revenue. Indirectly, counties and municipalities will benefit from increased sales tax revenue from increases in population and resultant demand for goods and services. If reasonably foreseeable future actions are constructed and operated, there will be a MODERATE cumulative impact on local finance. Contributions from the Dewey-Burdock ISR Project are expected to have a SMALL to MODERATE incremental impact on local finance.

The NRC staff determined that the cumulative impact on socioeconomic resources resulting from past, present, and reasonably foreseeable future actions ranges from SMALL to MODERATE. Impacts to population and local finance will be MODERATE; impacts to employment will be SMALL to MODERATE, and impacts to housing, education, and public services will be SMALL.

The NRC staff conclude that the proposed Dewey-Burdock ISR Project will have a SMALL to MODERATE incremental effect on socioeconomic resources when considered with other past,

present, and reasonably foreseeable actions. Impacts to population, housing, local finance, and education will be SMALL to MODERATE, while impacts to employment and public services will be SMALL.

5.12 Environmental Justice

Impacts relating to environmental justice for the proposed Dewey-Burdock ISR Project are described in detail in SEIS Section 4.12. The geographic boundary for this resource includes Custer and Fall River Counties in South Dakota, Weston County in Wyoming, and the Pine Ridge Indian Reservation in Shannon County, South Dakota. The timeframe for the analysis is 2009 to 2030 (see SEIS Section 5.1.2 for the estimated operating life of the proposed project).

As described in SEIS Section 4.12.1, NRC staff determined that the percentage of minority populations living in affected block groups in the vicinity of the proposed Dewey-Burdock ISR Project site in Custer, Fall River, and Weston Counties does not significantly exceed the percentage of minority populations recorded at the state and county levels and is well below the national level. Furthermore, NRC staff determined the percentage of low-income populations living in affected census tracts in the vicinity of the proposed project site in Custer, Fall River, and Weston Counties does not significantly exceed the percentage of low-income populations recorded at the state or county level. Based on an analysis of potential impacts to minority and low-income populations described in SEIS Section 4.12.2, NRC concluded that there will be no disproportionately high or adverse impacts to minority or low-income populations residing near the proposed project area.

In GEIS Section 6.4, NRC staff identified the Native American Oglala Sioux Tribe as a minority population in the Nebraska-South Dakota-Wyoming Milling Region and the Pine Ridge Indian Reservation as a low-income population (NRC, 2009a). The Pine Ridge Indian Reservation is located in Shannon County, South Dakota, approximately 80 km [50 mi] from the proposed Dewey-Burdock ISR Project. Environmental justice impacts related to the protection of cultural and religious resources of significance to the Oglala Sioux Tribe and other potentially affected Native American tribes are being addressed through the NHPA Section 106 consultation process as described in SEIS Sections 1.7.3.5 and 4.9.1. As described in SEIS Section 4.12.1, environmental justice impacts to Native American tribes will primarily be no different than those experienced by other populations within the vicinity of the project area. Although the proposed action may potentially affect certain sites of religious or cultural significance to the tribes, the impacts to such sites would be reduced through mitigation strategies developed during Section 106 consultations.

Because the economic base of the study area includes ranching, government, tourism, and resource extraction, low income areas are not only widely dispersed but small in size. Furthermore, it is unlikely that race and poverty characteristics in regions surrounding the proposed Dewey-Burdock ISR Project area will change significantly as a result of past, present, and reasonably foreseeable future projects discussed in Section 5.1.1. For reasonably foreseeable future actions, the extent to which there will be potential environmental impacts (e.g., visual impacts of wind turbines and transmission infrastructure associated with wind energy projects) and health and safety risks that create an environmental justice concern will depend on the precise location of low-income and minority populations in relation to specific projects. Full analysis of the potential impacts of specific projects on low-income and minority populations will be undertaken as part of site-specific environmental justice reviews of each proposed development site.

Based on available minority and low income population information and the analysis of human health and environmental impacts presented in Chapters 4 and 5, NRC staff conclude that the potential for adverse incremental impacts within the study area will be SMALL. The NRC staff also conclude that the proposed project will have a SMALL incremental impact on environmental justice populations when added to the SMALL cumulative impacts from other past, present, and reasonably foreseeable future actions.

5.13 Public and Occupational Health and Safety

Cumulative impacts on public and occupational health and safety were evaluated within a 105-km [65-mi] radius of the proposed Dewey-Burdock site. This distance was chosen because the nearest operating ISR facility to the proposed Dewey-Burdock site is located approximately 105 km [65 mi] south at Crow Butte in Dawes County, Nebraska. The timeframe for the analysis is 2009 to 2030 (see SEIS Section 5.1.2 for the estimated operating life of the facility).

The public and occupational health and safety impacts from the proposed Dewey-Burdock ISR Project will be SMALL and are discussed in detail in SEIS Section 4.13.1. During normal activities associated with all phases of the project lifecycle, radiological and nonradiological worker and public health and safety impacts will be SMALL. Annual radiological doses to the population within 105 km [65 mi] of the proposed project will be far below applicable NRC regulations. For accidents, radiological and nonradiological impacts to workers may be MODERATE if the appropriate mitigation measures and other procedures intended to ensure worker safety are not followed. Typical protection measures, such as radiation and occupational monitoring, respiratory protection, standard operating procedures for spill response and cleanup, and worker training in radiological health and emergency response, will be **required as a part of the applicant's NRC-approved Radiation Protection Program** (Powertech, 2011). These procedures and plans will reduce the overall radiological and nonradiological impacts to workers from accidents to SMALL.

Past, existing, and anticipated future uranium recovery facilities in the vicinity of the proposed Dewey-Burdock ISR Project and within the broader regional area are described in Section 5.1.1.1. Abandoned open pits and overburden waste piles associated with past surface mining activities occur in the Burdock portion of the proposed site (see Figure 3.2-3). Radiation surveys have revealed that soils in and near the old surface mining works have elevated radiation levels (see SEIS Section 3.12.1), which could potentially increase radiological doses to onsite workers. Within a 105-km [65-mi] radius of the proposed project, there is one operating ISR facility at Crow Butte in Dawes County, Nebraska. In addition, three satellite facilities or ISR expansions for the Crow Butte site are in the planning or licensing stages: North Trend, Three Crow, and Marsland. The applicant has also identified a potential ISR project at Dewey Terrace in Niobrara and Weston Counties, Wyoming (Powertech, 2009b). If constructed and operated, each of these facilities will have similar radiological and nonradiological impacts on public and occupational health and safety to those at the proposed Dewey-Burdock site. Potential cumulative impacts from these facilities will result from incremental increases in annual radiological doses to the population when combined with the impacts of the proposed Dewey-Burdock ISR Project.

As stated in Section 4.13.1, for normal operations, Rn-222 will be the only significant radionuclide anticipated to be released at the proposed Dewey-Burdock ISR Project; the primary sources will be from wellfield venting and releases from within the central plant for process operations (predominantly via vent stacks on the ion-exchange columns and various

tanks). As further described in SEIS Section 4.13.1, the maximum expected exposure to a member of the public is located southeast of the Dewey satellite facility within the proposed Dewey-Burdock project permit boundary (see Figure 4.13-1). This maximum exposure is estimated to be 0.06 mSv/yr [6.0 mrem/yr] and is consistent with estimates of expected exposure levels at other operating ISR facilities in the United States (NRC, 2009a). This exposure, combined with exposures from other operating and potential ISR facilities in the study area, will remain far below the 10 CFR Part 20 public dose limit of 1.0 mSv/yr [100 mrem/yr] and have a negligible contribution to the 6.2 mSv [620 mrem] average yearly dose received by a member of the public from all sources.

As described in SEIS Section 4.13.1, both worker and public radiological exposures are addressed in NRC regulations at 10 CFR Part 20. Licensees are required to implement an NRC-approved radiation protection program to protect occupational workers and ensure that **radiological doses are “as low as reasonably achievable” (ALARA)**. The applicant’s radiation protection program includes commitments for implementing management controls, engineering controls, radiation safety training, radon monitoring and sampling, and audit programs (Powertech, 2011). Measured and calculated doses for workers and the public are commonly only a fraction of regulated limits. Analysis of three separate accident scenarios (thickener failure and spill, pregnant lixiviant and loaded resin spills, and yellowcake dryer accident release) will also result in hypothetical exposures that are less than NRC regulatory limits and produce SMALL potential impacts (SEIS Section 4.13.1.1.2.2).

The types and quantities of chemicals (hazardous and nonhazardous) for proposed use at the Dewey-Burdock ISR Project do not differ from those evaluated in the GEIS. The use of hazardous chemicals at ISR facilities is controlled under several regulations (see SEIS Section 4.13.1.1.2.3 for a list of these regulations) that are designed to provide adequate protection to workers and the public. The handling and storage of chemicals at the facility will follow standard industrial safety standards and practices. Industrial safety aspects associated with the use of hazardous chemicals are regulated by the South Dakota OSHA. Nonradiological worker safety will be addressed through occupational health and safety regulations and practices.

Other past, present, and reasonably foreseeable future actions in the vicinity of the Dewey-Burdock Project that could contribute to nonradiological public and occupational health and safety include oil and gas exploration, wind energy projects, the proposed Dewey Conveyor Project, and the proposed DM&E PRB Expansion Project (see SEIS Sections 5.1.1.3, 5.1.1.4, and 5.1.1.5). Increased risk to human health and safety will occur during development and operation of these projects from the inherent hazards associated with construction and maintenance activities. However, these risks will be minimized by implementation of BMPs, development and implementation of health and safety programs, safety setbacks to nearest residences, mitigation measures, and compliance with applicable federal and state occupational and public safety regulations (BLM, 2005, 2009a; STB, 2001). Hazardous materials that are likely to be used during these ongoing and reasonably foreseeable future projects include diesel fuel, gasoline, hydraulic fluids, motor oil/grease, and compressed gasses used for welding (e.g., acetylene or propane). A large-scale release of diesel fuel or several of the other substances used at the projects may have implications for public health and safety. The location of the release will be the primary factor in determining its importance. However, the probability of a release anywhere along a proposed transportation route is extremely low, the probability of a release within a populated area will be even lower, and the probability of a release involving an injury or fatality will be still lower (BLM, 2009a). Therefore, it is not anticipated that a release involving a severe effect on human health and safety will occur during

these ongoing and potential future actions. In addition, ongoing and potential future actions will have federal- and/or state-mandated spill prevention and control plans to prevent spills of oil and other petroleum products and other hazardous materials during construction and operation activities (BLM, 2009a; STB, 2001).

The NRC staff have determined that the cumulative impact on public and occupational health and safety in the study area resulting from all past, present, and reasonably foreseeable future actions is SMALL. This finding is based on estimates of combined radiological exposures from currently operating and proposed future ISR facilities in the study area, which are estimated to remain far below the regulatory public limit of 1.0 mSv/yr [100 mrem/yr] and have a negligible contribution to the 6.2 mSv [620 mrem] average yearly dose for a member of the public from all sources. Nonradiological exposures to workers and the general public from hazardous chemicals and materials resulting from past, present, and reasonably foreseeable future actions will be minimized by implementation of BMPs, mitigation measures, and compliance with applicable federal and state occupational and public safety regulations.

The NRC staff conclude that the proposed Dewey-Burdock ISR Project will have a SMALL incremental impact on public and occupational health when considered with all the other past, present, and reasonably foreseeable future actions in the study area. The maximum expected exposure to a member of the public at the proposed Dewey-Burdock Project is estimated to be 0.06 mSv/yr [6.0 mrem/yr] and is consistent with estimates of expected exposure levels at other operating ISR facilities in the United States (NRC, 2009a). Because the facility is located in a remote, sparsely populated area, the exposure to members of the public will be limited. Occupational health hazards will be limited because licensees are required to implement an NRC-approved radiation protection program to protect workers. As described in SEIS Section 4.13.1.1.2.3, the handling, storage, and disposal of chemicals at the proposed project would follow standard industrial safety standards and practices and the applicant must comply with EPA, SDDENR, and OSHA regulations regarding the industrial and environmental safety aspects associated with the use of chemicals.

5.14 Waste Management

Waste management impacts from the proposed Dewey-Burdock ISR Project would be SMALL to MODERATE and are detailed in SEIS Section 4.14.1. Cumulative impacts on waste management were considered within a 105-km [65-mi] radius of the proposed Dewey-Burdock Project site, and the timeframe for the analysis is 2009 to 2030 (see Section 5.1.2 for the estimated operating life of the facility). This distance was chosen because the nearest operating ISR facility that could generate waste volumes consistent with those projected for the proposed Dewey-Burdock site is located approximately 105 km [65 mi] south at the Cameco Crow Butte operation in Crawford, Nebraska.

The proposed Dewey-Burdock ISR Project will generate radiological and nonradiological liquid and solid wastes that must be handled and disposed of properly. Waste streams and the types and volumes of wastes to be disposed are described in SEIS Section 2.1.1.1.6. The primary radiological wastes are process-related liquid wastes, waste treatment solids, and process-contaminated structures and soils, all of which are classified as byproduct material waste. As discussed in SEIS Section 4.14.1, liquid byproduct material generated during operations is composed of production bleed, waste brine streams from elution, laundry water, plant washdown water, laboratory chemicals, and aquifer restoration water. Liquid byproduct material will be treated onsite using a combination of ion exchange, reverse osmosis, and

radium settling followed by deep disposal in Class V injection wells, land application, or combined deep well disposal in Class V injection wells and land application. State- and federal-permitting actions, NRC license conditions, and NRC and state inspections ensure that proper waste disposal practices will be used to comply with safety and environmental requirements to protect workers, the public, and the environment.

As described in SEIS Section 4.14.1, the overall impacts from the disposal of process-related liquid wastes at the proposed Dewey-Burdock ISR Project will be SMALL. In addition, impacts associated with disposal of solid radioactive wastes will be SMALL based on the required preoperational disposal agreements made between the licensee and the licensed byproduct material waste disposal facility. Hazardous waste disposal impacts at the proposed Dewey-Burdock Project will be SMALL based on the low volumes of waste generated. Impacts from disposal of nonradioactive, nonhazardous solid wastes will be SMALL during the construction, operations, and aquifer restoration phases of the proposed project based on estimated volumes and the available capacity of local municipal solid waste landfills. However, impacts from disposal of nonhazardous solid wastes will be SMALL to MODERATE during the decommissioning phase depending on the long-term status of existing local landfill resources. If local landfill capacity is not expanded prior to the proposed decommissioning phase, impacts will be MODERATE because the projected capacity of the local landfill (i.e., the Custer-Fall River landfill) will be insufficient to accommodate all the decommissioning nonhazardous solid waste. If local landfill capacity is expanded prior to the decommissioning phase, impacts from disposal of nonhazardous solid wastes will be SMALL.

Past, existing, and anticipated future uranium recovery facilities in the vicinity of the proposed Dewey-Burdock ISR Project and within the broader regional area are described in Section 5.1.1.1. Abandoned open pits and overburden waste piles associated with past surface mining activities occur in the Burdock portion of the Dewey-Burdock site (see SEIS Figures 3.2-3). Radiation surveys reveal that soils near the old surface mining works have higher than background radiation levels (Powertech, 2009a). At present, there are no plans to clean up and reclaim the old surface mines. However, potential future state- or federal-funded cleanup and reclamation of the abandoned open pits and overburden waste piles will have an impact on waste management if the radioactive soils require disposal in a licensed byproduct disposal facility. As noted previously, within a 105-km [65-mi] radius of the proposed Dewey-Burdock ISR Project, there is one operating ISR facility at Crow Butte in Dawes County, Nebraska, which will generate waste volumes consistent with those projected for the proposed Dewey-Burdock ISR project. In addition, three satellite facilities or ISR expansions are in the planning and licensing stages at the Crow Butte site: North Trend, Three Crow, and Marsland (see SEIS Section 5.1.1.1). Powertech has also identified a potential ISR project at Dewey Terrace in Niobrara and Weston Counties, Wyoming (Powertech, 2009b). All of these potential ISR facilities will generate solid and liquid waste volumes consistent with those projected for the proposed Dewey-Burdock ISR Project, which could contribute to waste management impacts within the cumulative impacts study area. Generation of nonhazardous solid wastes at the planned and potential ISR facilities could impact landfill resources in the cumulative impacts study area. Impacts to landfill resources will be MODERATE if current landfill capacities are not adequate to accept nonhazardous solid wastes generated by the planned and potential ISR facilities and an expansion is necessary to accommodate added volume. Before ISR operations begin, NRC requires ISR facilities to have an agreement in place with a licensed disposal facility to accept byproduct material. Because radioactive wastes are so closely monitored throughout the United States, the impact on waste management from these potential facilities is anticipated to be SMALL.

Regarding the potential cumulative impacts of liquid waste disposal, the applicant is seeking permits from EPA for four to eight Class V deep disposal wells for liquid byproduct materials (Powertech, 2011, Appendix 2.7–L). **Additional deep disposal well use in the region** is anticipated as additional ISR facilities are licensed. The EPA-permitting process for these wells evaluates the suitability of proposals to ensure groundwater resources are protected and potential environmental impacts are limited to acceptable levels. Based on the assumption that EPA will not permit deep injection wells that will have a significant potential to impact groundwater resources, the NRC staff conclude the cumulative impacts of using deep disposal wells for the proposed action along with the potential impacts from present and reasonably foreseeable future actions will be SMALL.

Other ongoing and reasonably foreseeable future activities in the vicinity of the proposed Dewey-Burdock ISR Project site that may generate nonradiological hazardous wastes include oil and gas exploration, wind energy projects, and proposed transportation projects, such as the Dewey Conveyor Project and the DM&E PRB Expansion Project (see SEIS Sections 5.1.1.3, 5.1.1.4, and 5.1.1.5). Each of these projects will require shipment, storage, use, and disposal of hazardous materials and generation of solid and hazardous wastes; however, BMPs addressing these activities will effectively mitigate potential impacts. Each project will also be responsible for complying with applicable federal and state regulations and site-specific license agreements that manage generated wastes. For example, applicants will be required to comply with Department of Transportation Hazardous Materials regulations (49 CFR Parts 171 and 179) when handling, storing, and disposing hazardous materials. The types of hazardous substances that will likely be present during activities associated with these projects include diesel fuel, gasoline, hydraulic fluids, motor oil/grease, and compressed gases used for welding (e.g., acetylene, propane). Potential impacts will result from accidental releases of these substances during transportation, or during use and storage. The environmental effects of a release will depend on the substance, quantity, timing, and location of the release. The event could range from a minor oil spill on the project site where cleanup equipment will be readily available, to a severe spill during transport involving a large release of fuel or other hazardous substance. Some of the chemicals could have immediate adverse impacts on water quality and aquatic resources if a spill entered a flowing stream. With rapid cleanup actions, contamination will not result in a long-term impact to soils, surface water, or groundwater.

The NRC staff have determined that the cumulative impact on waste management in the study area resulting from all past, present, and reasonably foreseeable future actions is SMALL to MODERATE. All present and reasonably foreseeable future actions will implement BMPs to address shipment, storage, use, and disposal of radiological and nonradiological hazardous materials (both liquid and solid) and will be required to comply with applicable federal and state regulations and site-specific license agreements that manage generated wastes. Impacts to landfill resources will be MODERATE if current landfill capacities are not adequate to accept nonhazardous solid wastes generated by the planned and potential ISR facilities and an expansion is necessary to accommodate added volume.

The NRC staff conclude that the proposed Dewey-Burdock ISR Project will have a SMALL to MODERATE incremental impact on waste management when considered with all the other past, present, and reasonably foreseeable future actions in the study area. The applicant will be required to obtain the necessary permits and contractual agreements for disposing of its solid byproduct material, hazardous waste, and nonradiological, nonhazardous solid and liquid wastes. In addition, the applicant will be required to comply with applicable federal and state regulations and site-specific license agreements for the management and disposal of process-related liquid wastes. Impacts from disposal of nonradioactive, nonhazardous solid

wastes will be SMALL during the construction, operations, and aquifer restoration phases of the proposed project based on estimated volumes and the available capacity of local municipal solid waste landfills. However, impacts from disposal of nonhazardous solid wastes will be SMALL to MODERATE during the decommissioning phase depending on the long-term status of existing local landfill resources. If local landfill capacity is not expanded prior to the proposed decommissioning phase, impacts will be MODERATE because the projected capacity of the local landfill (i.e., the Custer-Fall River landfill) will be insufficient to accommodate all the decommissioning nonhazardous solid waste. If local landfill capacity is expanded prior to the decommissioning phase, impacts from disposal of nonhazardous solid wastes will be SMALL.

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